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EMERGENCY NURSES ASSOCIATION

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The Emergency Nurses Association Family Today

Terry M. Foster, MSN, RN, CCRN, TCRN, CPEN, CEN, FAEN

The interesting thing about the "way it was" is how nothing ever goes back to the "way it was" when the world goes through something as dramatic as we've seen since the pandemic hit us in early 2020. Most of us remember what air travel was like before September 11, yet we've learned to coexist with what it takes to get on a plane in the past 21 years.

The more experienced Emergency Nurses Association (ENA) members probably remember nursing before the AIDS epidemic. The "way it was" then involved no gloves, no goggles, and very little thought to how we might be endangered while caring for our patients. Gloves were only for the physicians and not the nurses!

The "way it was" for me when I started in nursing: If a patient didn't like the "emergency room" at our hospital, they were encouraged to go find another one. The emergency room chart was one piece of paper and one clipboard. If a physician got angry, they might throw that clipboard across the room like a frisbee—sometimes at a nurse! And, finally, with only 1 or 2 cardiac monitors, we "eyeballed" intravenous drips for Isuprel, Aramine, and Bretylium!

It's only natural for us to think back about the "way it was" personally and professionally, but know all we really can do is live and work for today. As emergency nurses, we certainly know that every day is a gift, with a focus on building a better future for ourselves, our coworkers, our patients, and the people and things that matter most to us.

I wouldn't be here, becoming ENA's president, without understanding how to adapt and evolve to the changes in life and at work. Believing only in the "way it was" would have left me behind if I didn't focus on what is happening today. My entire nursing life, I have been blessed to work with a tremendously talented group of emergency nurses and physicians at St. Elizabeth in northern Kentucky who I lean on to learn from as much, I hope, as they look to me for experience and guidance.

Our new emergency nurses are not a threat; they are an asset in every emergency department. Those of us with more than a few years of experience in our scrubs should embrace the youth and fresh perspectives that arrive with each new face who joins our team.

Show them the ropes; tell them what you know. Explain to them how to spot an ectopic pregnancy, a "triple A," or a renal calculi "from across the lobby." (You just visualized the clinical picture of all three, didn't you?) In many cases, they're not learning those clinical assessment skills in nursing school. Hold their hand through the process. Throwing them to the wolves—that "way it was" is not a recipe for success in these modern times. Sharing your wealth of experience, intuition, and expertise takes so little, but can mean so much as the years go by. One day, the hand of a new nurse you hold today might be the very hand holding yours when you or your loved one desperately need it most.

Fortunately, ENA provides us so many opportunities to help bridge the gap between the generations because we truly have so much in common. ENA was so important in my career, helping me grow and develop as a clinician, but also giving me a network—no, really, a family—that I could always turn to. We've been through tremendous highs and lows, marriages, births, and deaths—both in our ENA family and our own. I don't think I could have made it through my own loss and struggles without the love and support of my ENA family so many years ago.

Let's remember, though, ENA represents all emergency nurses, regardless of age, experience, or their backgrounds. ENA must be a leader for everyone, novice to expert, first day on the job to chief nursing officer, young and old. I want to ensure that all of us—no matter where we are in

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our careers—do all we can to leave the specialty and ENA better than where we found it. At ENA general assemblies and conferences, we have a habit of really welcoming new delegates or new attendees. Let's start doing the very same thing at work.

You can also support your emergency nurse friends and peers—and ENA—by volunteering for a committee, offering a quick tip in the CONNECT Community, and building a community of your own within your nursing network and through mentoring opportunities, such as the program ENA has available.

Engaging our new members is part of this. Show them that the ENA way is about supporting them today and into the future. Show them they belong to this family and are wanted in the emergency department. Show them what will be, so no one ever mistakes the "way it was" for the best things ever were.

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MAKING THE *JOURNAL OF EMERGENCY NURSING* POP!

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As the *Journal of Emergency Nursing (JEN)* enters its 50th anniversary, I am proud to have served as its interim Editor-in-Chief and look forward to Dr Anna Valdez's leadership as the new Editor-in-Chief. As a lifetime member of the Emergency Nurses Association (ENA), previous chapter and state leader, and a 2018 to 2020 ENA Board of Directors member, I met with a mass of emergency nurses over the years. I listened and learned about members' wants and needs as they relate to the content for *JEN*. Based on these interactions, I recognized that *JEN* needed to POP! during the transition period between Editors-in-Chief. POP! stands for partnerships, opportunities, and performance. In my final editorial as the interim Editor-in-Chief, I'd like to highlight a few achievements of *JEN* that were accomplished during this transition period with the support of *JEN*'s Editorial Board (Susan Barnason, Mohamed El-Hussein, Patricia Normandin) and Managing Editor (Annie Kelly).

Partnerships

To maximize the relevance of content for *JEN* readers, I partnered with the American Academy of Pediatrics and American College of Emergency Physicians to copublish a policy statement on pediatric safety in the emergency care setting.[1] I also partnered with the *Advanced Emergency Nursing Journal* to reprint a guest editorial focused on the 2021 emergency nurse practitioner competencies.[2] I look forward to reading about future partnerships yielding translatable content to the international audience of *JEN* readers.

Opportunities

Opportunities have been made available for authors to publish projects with the potential for impacting the triple aim of health care, specifically "improving the experience of care, improving the health of populations, and reducing per capita costs of health care" (p. 759).[3] *JEN* is perfectly situated as the premiere emergency nursing journal to afford these opportunities for both novice and expert authors. Opportunities continue to be available for authors and author teams originating from across the globe to publish in *JEN*. Examples of articles with relevance to the triple aim and emergency nursing practice include Faber et al's[4] article on a rapid assessment zone to reduce patients leaving without being seen and Thomas et al's[5] article on a pediatric distance learning curriculum, both in the current January issue.

Performance

As the Associate Editors, Annie Kelly, and I wrote in our September 2022 editorial,[6] *JEN* is committed to publishing content that gets back to the roots of emergency nursing practice. As a scientific journal, *JEN* has continued to publish quality research—providing the research addressed clinical relevance for emergency nursing. We also increased the content of our sections, which, based on our recent readership survey, is highly valued. For example, in the November 2022 issue, Somes[7] described a campaign to increase older adult driver safety in the Geriatric Update column. We also resumed our Emergency Nursing Review Questions column to help readers prepare in obtaining their certification in emergency and pediatric emergency nursing, which supports the ENA's position that "attainment of emergency nursing certification contributes to the delivery of safe, effective, quality care" (p. 299).[8]

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Conclusion

With each new Editor-in-Chief, *JEN* is transformed. During my interim period, I provided a transition between Dr Jessica Castner and our new Editor-in-Chief Dr Anna Valdez. I am deeply honored to have received the trust and confidence of the ENA Board of Directors and the *JEN* Editorial Board to have served as the interim Editor-in-Chief for the previous 7 months. I especially look forward to witnessing Dr Valdez elevating *JEN* as she continually improves the quality and impact of the published articles. I also am excited to hear her upcoming vision for *JEN* and seeing it POP!

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New Life and Tragic Loss: A Story of Resilience

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New life, tragic loss, faith, family, and resilience are key themes that abound in emergency nursing. In this story, readers also may discover examples of leadership development, clinical advancement, collaboration, and a culture of caring.

Preface

This story starts in 1985 in Orange County, CA, when a woman went into preterm labor at 32 weeks. The woman and her obstetrician did not know that she had an undiagnosed placenta previa. A baby girl was born after the placenta, with a nuchal cord, and she was in respiratory arrest. The baby was resuscitated and taken to the Neonatal Intensive Care Unit (NICU), where she remained for the next few weeks. The physician told the mother that her baby only survived because of the actions of the nurses involved in the delivery and resuscitation. That baby was me!

The primary NICU registered nurse (RN), Mary, had only been working in the NICU for a year. A young eager nurse at the beginning of her career, she had a passion for caring for the hospital's smallest and arguably the most vulnerable population. It wasn't until years later that she learned how this chance encounter at my birth would impact my life in the future.

An Emergency Nurse's Greatest Fear

Fast forward to years later in the emergency department. I was helping another relief charge nurse plan for our day and volunteered to work with a preceptee. No sooner did my preceptee arrive, the tones went off, "Code White ED… Code White ED… Code White ED."—this signified a neonatal emergency. My heart momentarily stopped, and the panic many RNs feel when we hear those words enveloped the team. One of my first thoughts was, "How am I supposed to focus and teach at the same time?" I quickly gathered myself and prepared for the patient's arrival.

Limited pre-arrival information was available as the paramedics "scooped and ran" from a local urgent care. There was something about an infant possibly in cardiac arrest. I quickly laid the Broselow tape (Armstrong Medical Industries, Inc, Lincolnshire, IL) on the bed and showed my preceptee how we measure approximate weights in this situation. The Broselow tape has been shown to accurately estimate weight in pediatric patients weighing 18 kg or less.[1] We pulled out intravenous equipment as well as the intraosseous drill, because we were not sure of the infant's condition and what we would need to grab first.

The infant arrived in cardiac arrest. Cardiopulmonary resusciation was in progress. I immediately snapped into the zone and began to work. The neonatologist secured the airway and requested assistance from an NICU nurse. That NICU nurse was "my" RN at the time of my birth. I suddenly felt more at ease when I saw Mary walk in. We had been in infant resuscitations together before, and I knew that she was the support I needed.

I accompanied the ED physician as we went to speak with the parents, and my preceptee followed. This is one of the most difficult conversations that ED staff can have. I gently put my hand on the shoulder of my preceptee and whispered to her, "You are okay, just breathe." In that moment, she needed to know that I was there to support her and that she could trust and lean on me. Cardiac arrests can be very overwhelming and traumatic for the new graduate nurse, especially when an infant is involved. Providing emotional support to new graduate nurses is important and has been shown to increase assurance and a sense of relaxation and safety.[2] New nurses emulate the behaviors they observe modeled in front of them. Remaining calm and focused provided reassurance to the new nurse I was working with and showed her that it is possible to do

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so and remain emotionally in control during these types of situations.

We quickly returned to the resuscitation efforts, and return of spontaneous circulation was eventually obtained. After the infant was stabilized and the team left, I went to debrief with my preceptee and our clinical educator. We talked about emotions, the grief process, and the importance of processing. We also talked about how calm the resuscitation was. I was taken aback when my preceptee said that she was only able to be calm because of the calm demeanor I was projecting. While I may not have realized it, I was teaching by example during this resuscitation. The education in a critical, high-stress situation was not only attainable, but it may have left a lasting impression on our new nurse. Using the Married State Preceptor Model, my preceptee was able to work side by side with me during the code, which has been shown to reduce new graduate anxiety about independent practice.[3] The "Married State" refers to the concept that 2 individuals work together as a single unit to achieve a common goal. The expression "joined at the hip" is often used to describe this state. The learner progresses from working "side by side" with the preceptor, to "shadowing," and ultimately, to providing "frontline" care.

I went to clean up the room and found Mary gathering her equipment to take back to the NICU. Every time Mary and I work together, we reminisce about her working in the NICU during the month I was admitted there after my birth. Mary praised my poise and my skills during the code. That was very meaningful coming from an NICU nurse and especially one I look up to. I told Mary that having her there with me allowed me to stay focused and trust in myself.

Unfortunately, I've also experienced infants who passed away after emergency encounters, leaving me numb during the shift and days following. These feelings were expected after such a tragic loss, and, while I knew what to expect, I may not have been prepared for those emotions. After the numbness came irritability and anger. I was easily bothered by the littlest things at work and at home. By the next week, my mood returned to normal, but I knew I would never forget that case. Understanding the phases of grief is an important part of emotional wellness: denial, anger, bargaining, depression, and acceptance. Having people to confide in and talk to as well as maintaining physical health helps to promote emotional well-being and to prevent abnormal signs of grieving that may lead to posttraumatic stress disorder.[4] Self-care that week was exceptionally important for me and included getting enough sleep, eating healthy, and exercising. Not doing so could have led down a dark path of isolation, binge eating, and withdrawing from emotional connections.

Double Dose

Weeks later, while I was healing, I thought to myself, "If I didn't have another Code White case for a while, that would be great." I was in charge this time when I heard those tones again. This time, the code was in the NICU. As a member of the code team, I responded to the NICU. Collaboratively, we attempted to revive the neonate. I could see the emotion on the distraught faces of the NICU nurses. I too struggled to keep my emotions in check as I tried to stay focused; meanwhile, my heart was racing. The baby did not survive.

I introduced myself to the family and offered to pray with them. Praying publicly was not something I was comfortable with, but I knew I had to. Spiritual care has been shown to improve quality of care and benefit patients/families as well as provide spiritual wholeness and growth in nurses' personal and professional lives.[5] Faith and spirituality offer a sense of hope amid situations that seem hopeless. Spirituality is also a key component in holistic care and caring for the "whole" person. Being able to openly share my faith in these situations fills my heart and make me feel complete.

Later that day, I was called to another area of the emergency department to find a patient who had delivered an under-20-week fetus. How could this be happening right now? I thought to myself. We got a neonatal blanket from the NICU and wrapped the baby presentably, so that the baby could be held and grieved. I again offered to pray for this baby with the parents. The fetus was then placed in a bucket and sent to pathology. I struggled with this action and my desire to respect the life of the fetus, as they felt incongruent. The somberness I was feeling could be seen expressed on the faces of all my colleagues.

After this event, I reached out to my brother, an ED physician's assistant. I told him about praying for the babies and how scary it was. He responded, "You don't have to be a preacher to teach people about God." I immediately started to cry. Crying is often hard for emergency nurses after cases like these. Our subconsciousness tries to protect us, often dumping emotions, before we can even acknowledge them. I was grateful to my brother that night.

The next week, I received a text from a friend who works in our hospital's Clinical Excellence department, which is responsible to review cases such as resuscitations. She and I started as new graduate nurses together in 2009, and she had seen my name involved in both cases and reached out to make sure I was okay. I was comforted by

this action. It was nice knowing that someone was concerned about my well-being when as nurses we spend so much time focused on the needs of others.

Recognizing the Signs of Depression and Seeking Help

All nurses, both new and experienced, are at risk for moral injury after facing traumatic events. Managing ongoing stressors, recognizing signs of depression, and knowing how to seek help are invaluable. When working with new nurses after a traumatic event, I usually recommend that they take a few minutes after to reflect and explore their feelings related to the experience or on their way home. I also ask them to compare how they expected to feel during and after the event and the actual feelings they experienced. Self-care can take on many different forms. I have colleagues who enjoy the quiet solitude of a hot bubble bath, gardening on their days off, or spending time with their grandkids. Personally, I prefer a long run that allows me to expel energy and process my thoughts.

However, self-care is not always enough, and depression may develop. Recognition of signs of depression in either ourselves or our colleagues is an important component of promoting resiliency. Loss of interest in spending time with family or friends, calling in sick to work, self-medicating with alcohol, difficulty concentrating, responding slowly in a crisis, decreased productivity, and outburst toward patients and colleagues may be recognizable signs of depression in a nurse. Nurses often are uncomfortable admitting that they are struggling and may resist asking for help because of the stigma associated with mental health. Seeking professional medical care from a therapist can significantly improve one's mental health and promote resiliency.[6] The stress of the pandemic these past 2 years has led me personally to seek out a trauma therapist. Some of my colleagues have done the same. I try to speak openly with my colleagues about seeking care in hopes of further erasing the stigma.

Finally, one can speak to their nurse leaders about organizational resources such as an employee assistance program (EAP). EAPs are offered at no cost with the primary goal of assisting employees with emotional, marital, substance abuse, and other work-related issues. Programs commonly include opendoor policies, support groups, and counseling. Evidence shows that employees who participate in an EAP often report lower levels of anxiety, depression, and work-related stress. Employees also tend to experience increased life satisfaction and higher work engagement.[7]

Conclusion

I believe that the culture of my organization is somewhat unique from many other organizations because of the culture of family. To me, every person who works here is invested in the wellness and success of each other. These lasting relationships that we build allow us to get up each day and face the next unknown tragedy. It allowed me to be able to give my best self on these families' worst days. Emotional wellness and trauma were not talked about much in the past. Thankfully, in recent years, there has been a shift in focus to recognize the emotional toll that nurses face and healthy coping mechanisms to improve mental health and increase resilience.

Author Disclosures

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Submissions to this column are encouraged and may be submitted at jenonline.org where submission instructions can be found in the Author Instructions.

Ovarian Hyperstimulation Syndrome: A Case Report

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Abstract

Background: Ovarian hyperstimulation syndrome is a rare, life-threatening obstetric emergency. Early recognition and prompt treatment of ovarian hyperstimulation syndrome are essential owing to the risk of long-term complications associated with this condition.

Case Presentation: A 30-year-old female presented to the emergency department with a chief complaint of abdominal pain. After assessment and diagnostic testing, she was diagnosed as having ovarian hyperstimulation syndrome. The patient was admitted for 24-hour observation. The patient was discharged home with instructions to follow up with an outpatient reproductive medicine clinic. One month after her visit to the emergency department, the patient has not had any complications related to the diagnosis.

Conclusion: This manuscript outlines the case of a patient presenting to the emergency department with ovarian hyperstimulation syndrome that was promptly recognized and treated. It is important for emergency nurses to quickly identify the risk factors and clinical presentation of ovarian hyperstimulation syndrome to decrease the risk of long-term complications.

Key words: Case report; Ovarian hyperstimulation syndrome; Emergency nursing; Fertility treatment

Introduction

Abdominal pain is one of the most common complaints among patients presenting to emergency departments in the United States.[1] Patients with female anatomy are at an increased risk of experiencing a medical emergency related to reproductive complications such as hypercoagulation and blood clotting, reduced liver or kidney function, or acute respiratory distress. A serious but rare complication is ovarian hyperstimulation syndrome (OHSS). Patients diagnosed as having OHSS are becoming increasingly more common owing to the frequency of fertility treatment and egg donation procedures, combined with improved diagnostic technology. As a result, emergency nurses must be able to quickly recognize OHSS and provide rapid interventions to reduce the potential for long-term complications.

Case Report

A 30-year-old Caucasian female presented to the emergency department from home with a chief complaint of diffuse abdominal pain for 2 days. The patient's history revealed no previous medical problems or medical diagnosis. Home medications included cabergoline to decrease prolactin levels and ganirelix to prevent premature ovulation, both provided by the fertility clinic. Surgical history included an orthopedic repair surgery and 3 egg donation procedures. Initial vital signs were blood pressure of 118/78 mm Hg, heart rate of 96 bpm, respirations of 18 bpm, oral temperature of 36.5 °C (97.8 °F), and a pulse oximetry reading of 100% on room air.

Upon arrival, the patient reported she had an egg retrieval procedure 3 days earlier. A thorough physical examination found the patient awake, alert, and oriented with a Glasgow coma scale of 15. The patient reported diffuse abdominal pain for 2 days that radiated to the back with a bloating sensation. The patient rated her pain severe, reporting a pain level of 10 (range, 0-10 scale). The abdomen was soft and nondistended, bowel sounds were present in all 4 quadrants, and there was moderate abdominal tenderness

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upon palpation with guarding. Other reported symptoms included nausea, vomiting, and indigestion. The patient denied genitourinary symptoms, vaginal discharge, and vaginal bleeding.

Laboratory tests performed included urinalysis, complete blood count, serum chemistry, and a qualitative human chorionic gonadotropin (hCG). Pertinent laboratory results included a white blood cell count of 28.1×10^9/L, red blood cell count of 5.7×10^{12}/L, hemoglobin of 16.1 g/dL, hematocrit of 46.5%, and a negative qualitative hCG. Diagnostic testing consisted of computed tomography scan of the abdomen with intravenous contrast. The computed tomography scan of the abdomen revealed mild enlargement of bilateral ovaries with large follicular cysts with moderate abdominal ascites and a small left pleural effusion consistent with OHSS. Based on the results, the patient was diagnosed as having OHSS.

The emergency physician contacted the fertility clinic that completed the egg retrieval procedure. The reproductive endocrinologist was concerned about the hemoconcentration of the blood work and severe pain. Collaboration between the emergency physician and the reproductive endocrinologist resulted in a plan to admit the patient for 24-hour observation for repeat blood work and administration of intravenous fluids, analgesics, antiemetics, and anticoagulants owing to the risk of blood clots. During the patient's admission, the clinical team closely monitored the patient's vital signs and pain level. The patient received enoxaparin, maintenance fluids of lactated ringers at 125 mL/h, morphine, famotidine, and ondansetron.

Upon reassessment, the patient's pertinent laboratory values showed a decreased white blood cell count at 20.2×10^9/L. A mild decrease in hemoconcentration occurred after intravenous fluid administration. The patient had a repeat red blood cell count of 5.1×10^{12}/L, hemoglobin level of 15.1 g/dL, and hematocrit of 44.6%. The client reported decreased pain and nausea after medication administration. The client was discharged home after treatment. No further medical or surgical interventions were required. One month after the visit to the emergency department, the patient has not had any complications related to the OHSS diagnosis.

Discussion

OHSS is a serious but uncommon condition that usually occurs after ovarian stimulation procedures during the management of infertility and egg retrieval procedures.[2,3] The primary indicator of OHSS is an increase in capillary permeability that results in fluid shifts from the intravascular to extravascular compartments owing to an increase in vascular endothelial growth factor secretion.[2,3] This shift in capillary permeability leads to hemoconcentration, decreased perfusion of vital organs, and an increase in thromboembolic events.[2-4] Characteristics of OHSS include marked ovarian enlargement and extravascular exudate accumulation.[2,3] Rapid intervention and treatment of OHSS are associated with improved outcomes.

OHSS most commonly presents after in vitro fertilization procedures that stimulate the ovulatory process.[2] The administration of hormones used to induce oocyte maturation during in vitro fertilization has increased the prevalence of OHSS. The administration of exogenous hCG is the agent most often associated with OHSS development.[5] Other risk factors for OHSS are polycystic ovarian syndrome, history of OHSS, low body mass index, and young age.[2] Compared with Caucasian women, the risk of OHSS is higher for Black women and decreased for Hispanic women.[6]

Patients with OHSS typically present with abdominal pain, abdominal bloating, nausea, vomiting, and diarrhea.[3-5] Other symptoms include ascites and decreased urination.[5] Diagnostic tests for suspected OHSS include a complete blood count, chemistry panel with liver functioning tests, pregnancy test, urinalysis, transvaginal ultrasound, and computed tomography scan of the abdomen.[2] Laboratory results typically demonstrate increased hemoconcentration, with increased red blood cell count, hemoglobin, and hematocrit. With increased severity of OHSS, serum chemistry results may indicate abnormal kidney and liver functioning, hyperkalemia, hyponatremia, decreased albumin, and hypo-osmolarity.[2]

OHSS is classified into 4 categories, based on the severity of symptoms and laboratory findings. Stage 1 is mild OHSS, characterized by bilateral enlargement of ovaries (up to 8 cm) with multiple follicular cysts with abdominal bloating and pain. Stage 2 is moderate OHSS, characterized by enlarged ovaries (up to 12 cm), abdominal bloating, gastrointestinal symptoms (eg, nausea, vomiting, and diarrhea), and ascites. Severe ovarian OHSS is classified by large ovarian cysts ($> 12 \times 12$ cm), ascites, hyperkalemia, hyponatremia, hypo-osmolarity, hypoproteinemia, oliguria, abnormal kidney functioning, hemoconcentration with hematocrit $> 45\%$, white blood cell count $> 15{,}000$/mL, liver dysfunction, increased blood viscosity, and thromboembolic events. Finally, critical OHSS is diagnosed as having severe ascites, hematocrit $> 55\%$, white blood cell count $> 25{,}000$/mL, oliguria or anuria, creatinine ≥ 1.6 mg/dL, creatine clearance < 50 mL/min, thromboembolism, or acute respiratory distress (Table).[2]

TABLE
Stages of OHSS

Stages of OHSS	Clinical findings
Stage 1—mild OHSS	•Enlarged ovaries (up to 8 cm) •Multiple follicular cysts •Abdominal bloating and pain
Stage 2—moderate OHSS	•Enlarged ovaries (up to 12 cm) •Abdominal bloating •Gastrointestinal symptoms (eg, nausea, vomiting and diarrhea) •Ascites
Stage 3—severe OHSS	•Large ovarian cysts (> 12 × 12 cm) •Ascites •Hyperkalemia •Hyponatremia •Hypo-osmolarity •Hypoproteinemia •Oliguria •Abnormal kidney functioning •Hemoconcentration •Hematocrit > 45% •White blood cell count > 15,000 •Liver dysfunction •Thromboembolic events
Stage 4—critical OHSS	•Severe ascites •Hematocrit > 55% •White blood cell count > 25,000 •Oliguria or anuria •Creatinine ≥ 1.6 mg/dL •Creatine clearance < 50 mL/min •Thromboembolic events •Acute respiratory distress

OHSS, ovarian hyperstimulation syndrome.

Treatment and management of OHSS are determined by the severity of the condition. Many patients are admitted for observation, because mild presentations can suddenly progress to advanced stages. Administration of intravenous fluids for volume replacement is recommended with intravenous crystalloid fluids to maintain adequate urine output and reverse hemoconcentration.[2] Treatment of hyperkalemia with calcium gluconate and kayexalate may be needed. Anticoagulant therapy, such as enoxaparin, is recommended to prevent thromboembolic events.[2,3] Vasopressors may be needed if hypotension and signs of shock are present.[2] Antibiotic treatment is typically provided prophylactically and is recommended with the need for invasive procedures to remove fluid buildup in the abdominal or pleural space.[2,3] Depending on the severity of ascites, paracentesis may be needed if respiratory and renal compromises are present. Other procedures that may be performed include transvaginal aspiration and pleurocentesis with significant respiratory compromise, such as hypoxia, tachypnea, and dyspnea.[2,3] Patients with OHSS are at high risk of acute respiratory distress syndrome and multiple organ dysfunction syndrome owing to decreased perfusion related to the increase in capillary permeability. Patients with significant ascites and increased intrabdominal pressure are at even higher risk of systemic complications related to diminished perfusion.[3]

Conclusion

To promote optimal patient outcomes, the emergency nurse should be knowledgeable about the clinical presentation and risk factors of OHSS. Recognizing the condition and quickly intervening can prevent severe life-threatening complications. Patients with polycystic ovary syndrome and recent fertility technology and treatment should be closely evaluated for OHSS. It is important for emergency nurses to be aware of this condition and to query patients if they are using these therapies owing to the increased utilization of fertility technology and treatment.

Author Disclosures

Conflicts of interest: none to report.

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Emergency Medicine Images: Headache After a Lumbar Puncture

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Patient Presentation

A 34-year-old man presented to the emergency department for a persistent, positional headache 3 weeks after a routine lumbar puncture (LP) for the workup of multiple sclerosis. The headache started gradually approximately 1 week after the uneventful LP and consistently improved with lying flat and worsened when upright. At a previous ED visit for this headache, an epidural blood patch was considered for postdural puncture headache (PDPH); however, the anesthesia service did not think a blood patch would be better than conservative treatment, given the usual benign course and the expectation for near-term resolution of symptoms with PDPH. With the patient experiencing persistent symptoms affecting his daily activities despite home analgesics, the ED clinician ordered a noncontrast head computed tomography scan (CT) (Figures 1 and 2).

Diagnosis

BILATERAL SUBDURAL HEMATOMAS

Symptomatic subdural hematoma is a rare but potentially life-threatening complication of LP and neuraxial anesthesia described primarily in case reports.[1-3] The proposed mechanism of subdural hematoma after LP is via cerebrospinal fluid (CSF) leak resulting in decreased CSF pressure. This leads to sagging of the brain in the cranial vault, causing tearing or shearing of the bridging veins in the subdural space.[4-7]

PDPH is a common clinical diagnosis (does not typically warrant imaging) occurring in up to 11% of cases after LP (Table 1)[12]; however, clinicians must consider the differential diagnosis for PDPH to avoid missing potential dangerous conditions (Table 2). Further evaluation is warranted in patients with a prolonged headache (> 5-10 days) after LP, an intractable headache, a headache that persists or worsens after epidural blood patch, a new neurological deficit, or if the headache becomes nonpositional.[1,15,16]

The neurosurgical service offered the patient a bilateral decompressive craniotomy for symptomatic relief, but he elected for nonsurgical management. An epidural blood patch is contraindicated in patients with a CSF leak in the

FIGURE 1

Axial noncontrast head computed tomography. There are bilateral convexity subdural hematomas (arrows) and subdural hematoma along the interhemispheric fissure (chevrons). The lateral ventricles partially effaced.

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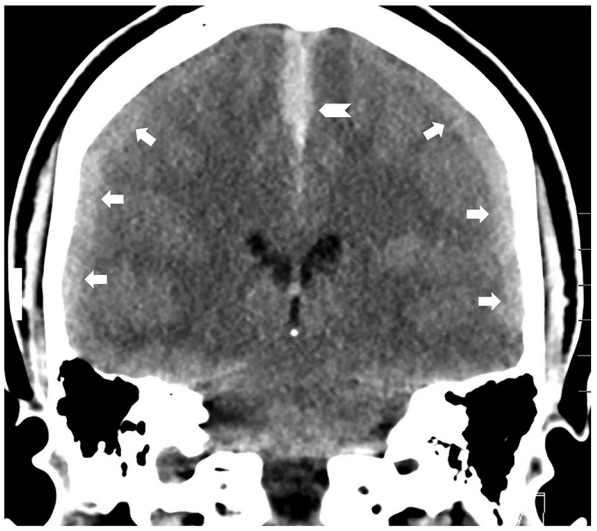

FIGURE 2

Coronal noncontrast head computed tomographyt. There are bilateral convexity subdural hematomas (arrows) and subdural hematoma along the interhemispheric fissure (chevrons). The lateral ventricles partially effaced.

presence of intracranial hemorrhage, as this may increase intracranial pressure.[1] The patient was discharged from the emergency department with a treatment plan for bedrest, an oral steroid taper, and 1 week follow-up with the neurosurgery clinic for re-evaluation and a repeat computed tomography scan. The patient fully recovered without surgical intervention.

TABLE 1

Postdural puncture headache: Common features and associated symptoms[8-11]

Common features and associated symptoms
• Headache onset within 5 days of lumbar puncture or within 2 days of unintentional dural puncture during epidural anesthesia
• Headache spontaneously improves within 2 weeks without treatment
• Positional headache (worse upright, improved supine)
• Nausea
• Neck stiffness
• Dizziness (including vertigo)
• Vision changes (blurred, diplopia, photophobia)
• Auditory disturbances (tinnitus, hearing loss)

TABLE 2

Differential diagnoses for postdural puncture headache[13,14]

Differential diagnoses
• Primary headache (ie, migraine, tension, etc.)
• Exacerbation of pre-existing chronic headache disorder
• Preeclampsia/eclampsia (in pregnancy and postpartum)
• Spontaneous intracranial hypotension
• Idiopathic intracranial hypertension
• Central nervous system infection
• Reversible cerebral vasoconstriction syndrome
• Posterior reversible encephalopathy syndrome
• Subdural hematoma
• Cerebral venous thrombosis

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Closing the Gap: The Role of Discharge Nurses in an Emergency Department

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Abstract

Introduction: Patients discharged from the emergency department may require a follow-up appointment with an outpatient specialty clinic. Referral processes vary by clinic, some requiring faxed referrals, some providing appointments immediately, and others contacting the patients directly. The frequency with which patients are successfully connected with outpatient follow-up services is largely unknown.

Methods: The ED discharge nurse role was developed to facilitate the navigation of patient follow-up and confirm that patients successfully connect with specialty outpatient clinics. Eight emergency nurses were recruited into this position to study the problem using a quality improvement approach. The ED discharge nurses reviewed referrals, contacted clinics and patients discharged from the emergency department, and intervened when barriers to transition occurred.

Results: The ED discharge nurses were able to determine specific causes and themes of missed appointments experienced by patients. Systemic problems identified include lost faxes, illegible contact information, incomplete referrals, and referral refusals by the clinics without patient notification. Considering the variability of clinic processes outside the emergency department's control, the ED discharge nurse role became crucial in minimizing the risk of lost/unsuccessful follow-up for patients discharged from the emergency department.

Discussion: Implementing the ED discharge nurse role created a contact for outpatient clinic referrals, patient inquiry, and a process to track errors and data to better understand the frequency of missed follow-up. In this quality improvement initiative, the role of the ED discharge nurse addressed the risk of patients falling through the cracks of a complex system.

Key words: Emergency department; Follow-up care; Discharge care; Outpatient clinics; Missed appointments; Transitional care

Introduction

The fragmented nature of health care systems has led to the variability of the quality, frequency, and effectiveness of cross-setting communication. As a result, patients and their families have served as integrators for these systems, navigating between providers and settings.[1] Patients are frequently discharged from the emergency department with an outpatient referral but without a scheduled follow-up appointment. They are then expected to either navigate a complex health care system to schedule follow-up appointments or wait for a telephone call from an outpatient clinic. The lack of standardized referral processes between individual outpatient clinics and emergency departments and the potential for clinics to decline a referral without notifying the patient lead to gaps in care. The consequence of miscommunication among the health care system, clinician care teams, and the patient contribute to missed follow-up care and increased risk for adverse patient outcomes and return visits to the emergency department.[2]

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The patient-practitioner relationship in the ED care setting is episodic, responding to the patient's immediate needs; however, given the increased complexity of health issues, patients may require 1 or more referrals for ongoing medical care and management outside the ED setting.[2] These care transitions can impart risk for patients when their follow-up is handed over from one setting to another.[3] The literature describes various risks associated with patients attempting to complete follow-up after an ED visit referral, including the mismanagement of the care transition journey when ED patients are discharged and referred to another practitioner or setting for follow-up.[3] Transitional care models have been used to combat various care transition challenges that patients experience while attempting to navigate the health care system. Transitional care models are usually time-limited, broad in range of services, and designed to ensure continuity of care, promoting the safe and timely transfer of care levels or settings and preventing poor patient outcomes.[3]

There is limited research on the frequency of scheduling and completed/successful outpatient follow-up appointments following patient discharge from the emergency department. Studies have identified contributing factors to patients revisiting the emergency department to include the following: not knowing whom to contact for follow-up care, failure to contact the provider leading to fragmented care, and difficulty scheduling follow-up with specialty clinics due to high volumes.[4-6] Missed follow-up rates create premature discontinuation of treatment, lack of diagnosis or misdiagnosis, and disjointed long-term management of chronic issues.[6]

PROBLEM

In the emergency department where this quality improvement initiative took place, indications that identified lost outpatient follow-up care after ED discharge included repeat ED visits following unsuccessful patient follow-up, patients not receiving follow-up appointments from clinics, and clinics reporting that they did not receive ED referrals. Before this initiative, most errors went undetected, and the outcomes of discharged ED patients and their outpatient follow-up appointments were unknown. Some patients who continued to wait for follow-up appointments contacted the hospital's patient relations department or the emergency department directly to inquire about the status of their pending follow-up appointment. In these instances, it was often the ED charge nurse who would troubleshoot the lost follow-up appointment. Attempting to coordinate and transition care to outpatient clinics was time consuming and resulted in additional workload for the charge nurse on duty.

Another trigger for action was inspired after a screening of the film, "Falling Through the Cracks: Greg's Story," which recounted how multiple cracks in the health system ultimately led to the death of a young man.[7] Recognizing that gaps in ED patient care follow-up to outpatient clinics lead to risks for patients inspired the implementation of the ED discharge nurse role trial. This intervention aimed to create and trial an ED discharge nurse role to support, facilitate, and examine barriers to ED patient follow-up with outpatient clinics. In creating this role, we hoped to improve discharged ED patients' care journey by increasing the frequency of the patient connecting with outpatient providers.

Methods

This quality improvement initiative was implemented in a community hospital in Canada. The emergency department here sees an average of 120,000 patients annually.[6] Between 2014 and 2019, the emergency department reported a 14% increase in patient visits and a 7% increase in patients who require outpatient services.[8] Approximately 60% of total ED visits are patients who live with 1 or more chronic diseases and are over 65 years old. These patients often require ongoing care and support from multiple care providers across various care settings.[8]

INTERVENTION

Approval from the ED Program Director was obtained to trial the new role. There was no additional funding available to implement the role but rather a redistribution and reassignment of the current ED nurse staffing. A daily 12-hour "float" position was redistributed to create the ED discharge nurse role to staff it within staffing allowances. A Plan-Do-Study-Act methodology was used to guide this quality improvement (QI) project. Squire guidelines were used as a template for this quality improvement intervention.[9] Retrospective ethics approval for this initiative was obtained from the hospital's research ethics board.

The ED discharge nurse role was established as a transition care coordinator role to facilitate, troubleshoot, and drive transitional care for discharged ED patients with pending follow-up outpatient clinic appointments. The priority in this role was to provide transition support by ensuring that discharged ED patients were connected to specialty care outpatient clinics directly. This role also included connecting with outpatient clinics to ensure that

referrals were received, obtaining referral statuses, and connecting with discharged ED patients to ensure that they were aware of their appointments and knew whom to contact if they had questions. Once confirmed, appointments were documented in the patient electronic health record for closed-loop communication. The emergency nurses recruited to this role were provided with a computer station in the emergency department, a direct phone line, business cards, and a direct ED discharge nurse email address to enhance communication between patients and health care providers via call, text, or email with any postdischarge concerns. The email also provided a venue for the ED discharge nurses to communicate, collaborate, and strategize with each other.

In the "Plan" phase, experienced emergency nurses were recruited by the clinical manager through an email to all ED staff nurses. Experienced emergency nurses were defined as having at least 5 years' experience in the ED care setting and being able to practice at full scope (cycling areas, acute, resus, and triage roles). By having emergency nurses in this role with comprehensive knowledge and expertise in providing ED clinical care, the ED discharge nurses were able to expertly assess, ask appropriate clarifying questions, and effectively advocate for and provide clinical guidance to patients with questions about their follow-up. A team of 8 emergency nurses were recruited to this role. The shift hours of work were 1 nurse per 09:00 AM to 9:00 PM shift, 7 days a week, to meet the demands of 24/7 hour ED services.

During the "Do" phase, ED discharge nurses collected data (described below) regarding the frequency of referrals that would have been missed and trended specific barriers related to receiving a clinic appointment. This facilitated informed follow-up directly with discharged ED patients and clinics. The process began with reviewing the charts of discharged ED patients who had a referral for an appointment with an outpatient clinic. Patient populations that were tracked and followed by the ED discharge nurse were discharged ED patients with a follow-up appointment request for an outpatient clinic or specialist, with a specific focus on clinics not booked through the internal computer system. The outpatient clinics/specialties that relied on faxed forms outside of the computer system were prioritized–for example, ear-nose-throat, gynecology, surgery, cardiac diagnostics, and consultations. Excluded from the QI project were patients who were seen by a consultant in the emergency department, admitted to the hospital, discharged from the emergency department with a clinic appointment booked on the internal hospital computer system, asked to follow up directly with their primary provider, and those who did not require follow-up.

In the "Study" phase of the QI analysis, charts of all patients discharged home to wait for outpatient clinic appointments were collected for the ED discharge nurse to review and follow up with the discharged ED patients and clinics the next day. The charts were assessed and evaluated to understand the post-ED care for patients and gather baseline data on the volume of patients requiring follow-up. Chart evaluations resulted in the development of a manual tracking tool by the ED discharge nurses to track appointments that did not reach the intended clinics, discharged ED patients with incorrect contact information, and lost consults. The ED discharge nurse then completed an incident report in the corporate electronic incident reporting system to document how many follow-up appointments would have been missed without their intervention and transitional coordination. This is how we tracked the number of patients who may never have been contacted by a clinic owing to referral errors and missed and/or lost appointments.

During the "Act" phase of the QI project, ED discharge nurses developed a document to streamline the clinic referral process (Figure 1). In continuous engagement with the most common referred clinics, 35 in total, the ED discharge nurses kept a running document of each clinic's specific preference and process and provided it to the ED unit clerks to promote awareness and proper completion of correct referral forms, sending referrals and follow-up connections with patients. Unit clerks also verified patient contact numbers before discharge from the emergency department. Specific information provided to unit clerks to streamline the referral process for select specialty clinics is shown in Figure 1.

ED discharge nurses collaborated with the interprofessional team of unit clerks, providers, and other ED discharge nurses to correct unintentional errors such as clerical errors, ordering additional testing as requested before a clinic appointment, re-faxing lost referrals, and/or referring to a more appropriate clinic if a patient referral was declined.

Results

This intervention aimed to create and trial an ED discharge nurse role to support, facilitate and examine barriers to ED patient follow-up with outpatient clinics and increase the frequency of the patients connecting with outpatient clinics/providers. The corporate electronic incident reporting system proved helpful to keep track of the number of outpatient clinic appointments that would have been missed

Clinic ordering information

***Please note-unless otherwise mentioned,patients will be called for an appointment time after they are D/C from the ED–by the clinic**

Clinic	MD	UCA	Nurse/MD	DC team
Spine clinic Referral Location: Address Fax: xxx xxx xxxx Phone: xxx xxx xxxx	Do not order on epic MD to fill out referral and give to UCA	• Fax referral form, ED summary and face sheet • Make a copy for DC team (referral, face sheet, faxed confirmation) • File original referral and faxed confirmation **Clinic will book appointment**	Give patient copy of referral Give patient AVS, Rx, etc. in the blue folder	Verify receipt of referral
Stroke prevention Referral Location: Address Fax: xxx xxx xxxx Phone: xxx xxx xxxx	MD to order on epic MD to fill out referral and give to UCA "Referral to neurology stroke prevention clinic"	Make a copy for DC team (referral and face sheet) **Clinic will book appointment**	Give patient AVS, Rx, etc. in the blue folder	Check to see if appointment is booked
Urology Location:	MD to order on epic (Scheduled in epic)	DATE & TIME AVAILABLE ON DISCHARGE	Give patient AVS, Rx, etc. in the blue folder	

FIGURE 1

Example of the clinic ordering information document. Each clinic is identified on the document, and specific requirements for each clinic are noted in relation to the provider actions. ED, emergency department; Epic, electronic health record; AVS, after visit summery; UCA, unit clerical assistant; DC, discharge nurses; Rx, prescription; MD, medical doctor.

without the intervention of the ED discharge nurse (Figure 2).

Data collection from November 20, 2019 to December 4, 2019 demonstrated that over 290 patients of interest were tracked by the ED discharge nurse during the "Do" and "Study" phases of the QI project. During this time, the emergency department of study averaged 300 patient visits per day. The data collection revealed that approximately 7% of daily ED visits were referred to a follow-up specialty clinic of interest. Of those patients of interest, 130 patients (44%) would have likely experienced unsuccessful outpatient clinic follow-up because of the barriers listed below and required ED discharge nurse intervention or transitional coordination to facilitate their follow-up appointment. The

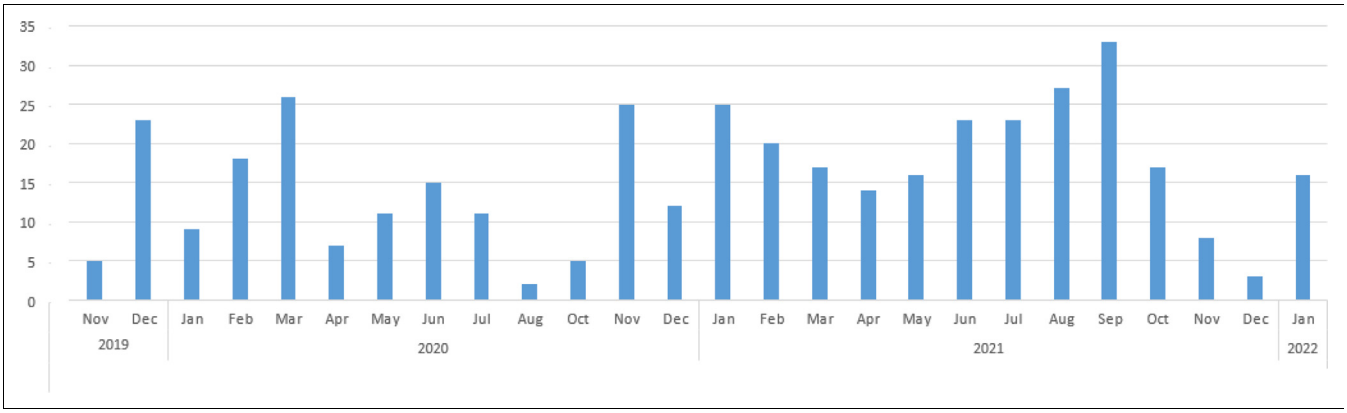

FIGURE 2

Monthly incident reports, recorded in the corporate electronic incident reporting system, for patients lost in follow-up (did not receive an appointment for or missed a follow-up appointment owing to lack of communication). Variances correlate to lower ED volumes and clinic closures during waves of COVID-19. ED, emergency department.

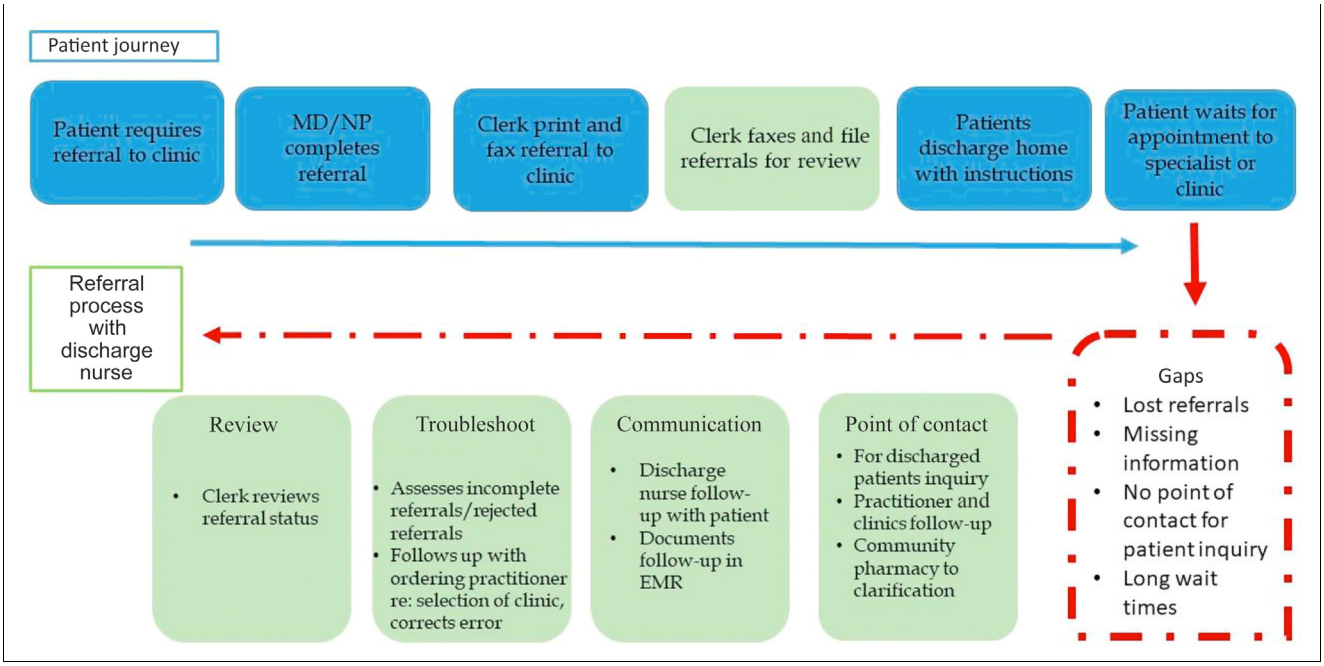

FIGURE 3

Process map of the patient journey through the ED discharge and referral process. Blue boxes indicate the patient's journey from disposition home to outpatient clinic follow-up. The red box identifies gaps in current process that lead to barriers for patients to successfully schedule follow-up clinic appointments. Green boxes represent the new referral process with the implementation of the ED discharge nurse. ED, emergency department; MD, medical doctor; NP, nurse practitioner; EMR, electronic medical (health) records.

ED discharge nurse team discovered specific barriers affecting successful follow-up, including need to confirm appointment date and time, and missing patient and/or clinic contact information, specifically fax numbers. The ED discharge nurse connected outpatient clinics and discharged ED patients for further clarification and guided patients with additional instructions to ensure that the patients were able to attend their follow-up care.

In October of 2020, after the corporate electronic health record implementation, the ED discharge nurses also began to follow up with the appropriate practitioner for abnormal results of microbiology and radiology rereads after ED discharge for further patient intervention and treatment, alleviating this workload from the ED charge nurse. Figure 3 is the process map that demonstrates the flow of the ED discharge nurse role.

It was not possible to electronically keep track of the specific reasons each appointment would have been missed, as discrete data fields were not available in the incident reporting system. Descriptive data were collected to determine whether ED discharge nurse interventions reduced the frequency of lost follow-up appointment incidents, specifically since the implementation of the clinic specific ordering information document in the "Act" phase of this project (implementation start date). Data collected over the same 2-week time period in November to December 2020 demonstrated a total of 38 incidents compared with 130 incidents 1 year earlier. Of the 38 incidents, 30 incidents (79%) were related to clinics not receiving the faxed referral, and 4 incidents (11%) resulted from incorrect/absent information on the referral form. Two incidents (5%) were related to language barriers and patients who did not fully understand appointment information when the clinic called them. The family members of the aforementioned 2 patients who experienced language barriers contacted the ED discharge nurse for navigation assistance. The remaining 2 incidents resulted from a misspelling of the name by the clinic and an incorrect selection of clinic by the ED team (5%). Over the same time period in November to December of 2021, the number of incidents was reduced to 7: 6 incidents (86%) of which were related to faxed referrals not being received by the clinic, and 1 incident (14%) related to a referral being faxed with incorrect patient information.

Data also were collected over a 4-month period (January to April 2022) to determine whether the implementation of the ED discharge nurse role decreased the frequency of discharged ED patients unsuccessfully connecting with

outpatient providers. This evaluation demonstrated 123 incidents of missed follow-up over 4 months (compared with the initial data of 130 incidents over 2 weeks: November 20, 2019, to December 4, 2019), which also were analyzed manually. Of those, 84 incidents (68%) of lost referrals were related to faxing problems including illegible faxes and faxes not received (despite electronic fax confirmation from the emergency department). Twenty-eight incidents (23%) were sent back to emergency department by the clinic as more referral information was requested from the ordering provider, including additional diagnostics tests before the appointment. Seven incidents (6%) were referrals that were rejected outright by the clinic, and a new clinic or follow-up destination was made. The remaining 4 incidents (3%) represent errors in ED booking processes; for example, appointments were booked incorrectly in the electronic system.

Discussion

The ED discharge nurse QI project shared similarities to other findings reported in the literature where fragmented care resulted from cross-setting communication failure.[9] ED discharge nurses found that most of the challenges existed with faxes, including incorrect fax numbers, legibility on the receiving end, and clinics reporting that they could not contact patients to provide their appointment. The QI project also supported and demonstrated the need to use the transitional care model to ensure continuity of care and promote the safe and timely transfer of care as identified the in literature.[3]

The ED discharge nurse has become the point of contact for discharged ED patients. Implementation of the ED discharge nurse began in September 2019 and revealed several system barriers contributing to the risk of missed follow-up care. In pursuing this project, in-depth knowledge of challenges to the discharged ED patient experience and system barriers during their journey after discharge from the emergency department to outpatient clinics was gained. Collectively, the ED discharge nurse group was able to uncover specific themes to the barriers that exist when transitioning follow-up from the emergency department of study to an outpatient clinic. Specific interventions developed by the ED discharge nurses included clarifying the contact list and fax numbers of clinics, obtaining the correct referral forms specific to each clinic, creating a clinical ordering information (Figure 2) document to communicate the process to all care providers, and having unit clerks on duty at the time of referral confirm patient contact information, specifically phone numbers.

In the 2 years since implementation, patients who would have missed follow-up before the interventions of the ED discharge nurses decreased from an initial 130 patients over a 2-week time span to 123 in a 4-month time span, demonstrating a decreased frequency of missed outpatient referrals since the interventions of the ED discharge nurses began. Importantly, the ED discharge nurses are able to contact those patients who would have lost their discharge follow-up, connect them with the appropriate clinic, and transition their care from the emergency department to outpatient services.

Limitations

The QI project was instrumental in understanding the challenges of outpatient clinic referrals for patients discharged from the emergency department and developing tools and processes to reduce lost referrals that affect ED patient follow-up care. The project includes ongoing data collection to track referral errors and monitor how often this affects the patients. However, there are no previous data for comparison, limiting the ability to assess improvement prior to the initiative. The COVID-19 pandemic in 2020 to 2022 also confounded data because of altered average ED visits and the closures and reduced hours of outpatient clinics during the ongoing waves of the virus. Incident report analysis was useful in identifying the presence and frequency of transition issues between the emergency department and outpatient clinics; however, data entry fields did not allow subcategory distinctions, requiring manual analysis to identify the frequency of specific trends. Future studies may wish to measure the number of ED return visits before and after implementation.[10]

Implications for Emergency Nurses

In transitional care from the emergency department to outpatient clinics, the ED discharge nurse assists transitions by mitigating challenges in the discharged ED patient's journey. They facilitate continued communication and collaboration among the interprofessional team, engage with the clinics, and provide additional support and reassurance for patients as they wait for their appointments. This also improves patient experience and satisfaction. The ED discharge nurse has alleviated team members' workload, specifically the ED charge nurse. This role facilitated transitional care between the emergency department and a variety of outpatient clinics, all of whom have unique forms

and referral processes and requirements outside of ED control and change. The reduction in lost follow-up may be extrapolated to general increased safety for patients requiring ongoing care and also to possible reduced ED return visits,[10] which were not measured in this project.

Although re-allocation of staff was required to fill the ED discharge nurse role at the expense of losing the "ED float nurse" position, establishing a transitional care process for outpatient follow-up was a priority. As the ED float role was primary for break relief, a new break relief schedule was implemented for nurses to cover one another. Additional research is required to understand the impact of this change.

Conclusion

The ED discharge nurse was a trial role in the emergency department of study supported by the ED manager and endorsed by the ED director. This support was crucial in developing the ED discharge nurse role. Recognizing the potential risk to discharged ED patients and assigning an emergency nurse to investigate, communicate, order additional tests, and book various appointments enabled ED discharge nurses to uncover many system barriers to lost follow-up with outpatient clinics. The ED discharge nurse team has remained engaged with outpatient clinics through continuous communication and assessment of referral statuses for discharged ED patients. This role also fostered relationship building between the emergency department and the outpatient clinics, which has facilitated collaboration focused on patient centered care as related to care transitions.

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A Pilgrimage Under the Midnight Sun for a Cause

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Section Editors: Pat Clutter, MEd, BSN, RN, CEN, FAEN, and Nancy Mannion, DNP, RN, CEN, FAEN

Key words: Fundraising; International emergency nursing; Hiking

June 24 at 3 AM, 5 kms (3 miles) from Rödön Church, Sweden. Something is outside the tent. Loud trampling woke me. It is already light outside. Tentatively, I look through from under the tent. A large bull moose is outside. Oh…he just turned his head toward me. I keep lying down, not moving a muscle. I see his silhouette shadowing on the fabric, I estimate his distance to be just a meter away. I keep silent, holding my breath. I keep questioning why I am doing this…

June 25 at 6 PM, just under 1 km to Ristafallet, Sweden. I am amazed. My heart is full watching these majestic waterfalls (see Figure 1). A show of the power of nature! It had been an impossible day, walking hours under the sun with temperatures around 31 °C (87.8 °F). I felt all the fatigue of the day being washed away. This has been an important reward and reminder to keep on going.

June 28 at 4 AM, the Swedish-Norwegian border. There is snow on the ground, and finally, wind has blessed me with its presence after 8 days of heat. I smell rain on the horizon, and for some reason, my feet feel light. I seem to walk with such ease, and although it seems as if I am running through the stages of the pilgrimage route like an ultramarathoner, it is more the energy of the path and a stubborn dedication to the campaign that move me. Just over 169 kms (105 miles) to go and just completed walking through Sweden. The end goal seems so near.

July 2 at 8 PM, Trondheim, Norway. I have arrived. It was a hard stage, walking through mountainous wetlands and hours of rain on open lands. It was a long day. And seeing the Nidaros cathedral on the horizon, a bittersweet feeling filled my very being. I was able to cover over 600 kms (373 miles) in 15 days. I was accompanied by amazing environs and moods the entire way. Completely focused on the here and now and at the same time experiencing worlds of divine nature that tugged at the heartstrings. The physical part of the campaign has been achieved, and one can honestly say it was a wonderful journey.

My name is Walter Sergio Lugari, and I am an emergency nurse from Germany (see Figure 2). I walked 600 kms of the St. Olavsleden (the northernmost pilgrimage trail that celebrates St. Olaf, the King of Norway from 1015 to 1028) from Sundsvall in Sweden to Trondheim in Norway to raise funds for the Emergency Nurses Association (ENA) Foundation. These funds would enable international emergency nurses without the means to afford access to important emergency nursing educational materials and programs to become nursing leaders in their own communities. Hence, under the "Where is Walter Campaign," I had the privilege to give back to ENA.

In 2019, I was a recipient of the International Scholarship to attend the Emergency Nursing conference in Austin, Texas. I still remember the moment that I opened that email. I was still relatively new in the emergency department and felt somehow behind schedule when it came to being adequately trained. It was a night shift, long and completely full of patients. It took a second to understand what I just read. The first words woke a sense of excitement and, of course, trepidation. I was to embark on a journey that would potentially change my life.

Then the day came. The early morning walk to the conference center filled my head with many thoughts; "What

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FIGURE 1
Close to Ristafallet, Sweden.

should I expect?" "What will I witness?" "Will I fit in here?" and, "Is this worth the financial and physical investment I've put in?" My first encounter witnessing the General Assembly as an observer was awe-inspiring. The machinations, the deliberate motions, and the elegance behind the structure of the different statements, all of which would make the organization stand for the interests of emergency nurses and, ultimately, all of our patients. Then came the advance practice sessions that inspired me to take the path I am currently engaged in. Seeing the mass of emergency nurses registering and taking part in the multitude of sessions and their engagement roused a sense of wonder and, guiltily, jealousy. This is a world that seemed so open, so engaged in providing the best possible experiences for its members. A world that drew me in to better myself, to engage and even give back.

One can set any expectation one wishes before coming to the conference. Nothing compared to this event, and all anticipations were broken and amplified. The richness of these experiences was without comparison. I never felt alone but rather part of an amazing family filled with incredible characters. And to answer that last question I asked of myself, yes, it was more than worth it. I came home laden with new knowledge and skills that catapulted not only my standing but also a passion for emergency nursing that I had never possessed before.

The international scholarship for the conference has been a powerful democratizer, allowing international emergency nurses to witness, experience, and engage in such an important if not life-changing event. It changed my view on emergency nursing and initiated a change in me to want to advocate for our profession and become a better emergency nurse. ENA, in itself, has made me desire to better myself.

In subsequent years, I became part of the International Advisory Council, and though heavily marked by the pandemic, it became a family for me. This year was also the year I took the reins of chairmanship. I have always been a believer in being grateful and giving back. Based on stories from other emergency nurses and my international experience as a nurse, I wanted to focus on international emergency nurses who do not and may never have the opportunity or means to be part of ENA, let alone take part in something as important as the Emergency Nursing conference. Consequently, the "Where is Walter Campaign" was born.

By donating through the ENA Foundation, there is a possibility to gift nurses access to important and lifesaving educational materials that could turn them into the nursing leaders within their own communities. Helping them become the leaders in their own lands is not only ideal

FIGURE 2
Author Walter Sergio on his pilgrimage on the St. Olavsleden pilgrimage trail.

but may be the necessary step to change the dire and present status of health care where they live and work. I hold this cause dearly. Through this special pilgrimage, I was able to raise $1226 for the Foundation.

The idea behind the campaign came to me as I was completing a different pilgrimage. Pilgrimages have been a physical rehabilitation and mental haven that have saved me. Walking and hiking hundreds of kilometers to a destination is something little more than being in a Zen mode. One confronts their own fears; the fear of failure, the fear of breaking down, the fear of being alone. One also faces physical and mental limitations. Dealing with having surgery on my knee that was not properly rehabilitated coupled with workplace psychological trauma, these pilgrimages or treks were my lifelines. At the same time, it served as a perfect setting to weave stories through metaphors of experience that surround us as emergency nurses (see Figure 3).

The day came, and I arrived at Sundsvall on the Baltic coast. It would have been a perfect start…then I realized that I had made an error with booking my accommodations–wrong month! Yet, a perfect stranger heard of my trip and offered me a couch to sleep on. Many more interesting encounters dotted my trip that then inspired days dedicated to several groups of people: international emergency nurses and nurses providing acute care with extremely limited resources, nurses who are hurting in the different dimensions of life, nurses who have left emergency departments or the nursing profession itself, those who have gone before us, and those who provide amazing support systems that take care of us.

FIGURE 3
Contemplating metaphors while on pilgrimage in the Norwegian countryside.

FIGURE 4
A lake near Medstugan on the Swedish-Norwegian border, a site the author used for many reflections on the St Olavsleden.

I was so inspired by what I was living: the paths, the scenery, and just the energy that completely engulfed me with a persistent rhythm. It filled my soul and reminded me to keep my feet on the ground and to keep practicing gratefulness. It felt natural, remembering those that brought me forward. I carried a pair of hiking poles gifted before my first pilgrimage by a mentor who is facing perhaps a very important personal battle. In return, I carried an extra pilgrim's passport and collected stamps in her honor. Practicing gratefulness came easy.

After this entire adventure, I realized several things: one needs to put the words one believes in into action, gratefulness begets a full heart, and never forget to pay it forward (See Figure 4). With these last teachings, I welcome all to apply for these scholarships, especially our international members, to embrace these lessons I have learned and contribute to making ENA the amazing organization that it is.

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The Feasibility of a Pediatric Distance Learning Curriculum for Emergency Nurses During the COVID-19 Pandemic: An Improving Pediatric Acute Care Through Simulation Collaboration

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Contribution to Emergency Nursing Practice

- Pediatric emergency medicine education was challenging during the COVID-19 pandemic because of the need to focus educational efforts on COVID-19 in adults.
- The curriculum was feasible for nurse educators and demonstrated high satisfaction and improvement in knowledge and critical actions among nurses who completed it.
- A continuing education nursing curriculum including telesimulation and brief asynchronous weekly educational activities facilitated by nurse educators, with support from the Improving Pediatric Acute Care Through Simulation collaborative, can improve general emergency medicine nurses' knowledge on pediatric topics and performance during telesimulations while maintaining physical distancing.

Abstract

Introduction: To develop and evaluate the feasibility and effectiveness of a longitudinal pediatric distance learning curriculum for general emergency nurses, facilitated by nurse educators, with central support through the Improving Acute Care Through Simulation collaborative.

Methods: Kern's 6-step curriculum development framework was used with pediatric status epilepticus aimed at maintaining physical distancing, resulting in a 12-week curriculum bookended by 1-hour telesimulations, with weekly 30-minute online asynchronous distance learning. Recruited nurse educators

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recruited a minimum of 2 local nurses. Nurse educators facilitated the intervention, completed implementation surveys, and engaged with other educators with the Improving Pediatric Acute Care through Simulation project coordinator. Feasibility data included nurse educator project engagement and curriculum engagement by nurses with each activity. Efficacy data were collected through satisfaction surveys, pre-post knowledge surveys, and pre-post telesimulation performance checklists.

Results: Thirteen of 17 pediatric nurse educators recruited staff to complete both telesimulations, and 38 of 110 enrolled nurses completed pre-post knowledge surveys. Knowledge scores improved from a median of 70 of 100 (interquartile range: 66-78) to 88 (interquartile range: 79-94) ($P = .018$), and telesimulation performance improved from a median of 60 of 100 (interquartile range: 45-60) to 100 (interquartile range: 85-100) ($P = .016$). Feedback included a shortened intervention and including physician participants.

Discussion: A longitudinal pediatric distance learning curriculum for emergency nurses collaboratively developed and implemented by nurse educators and Improving Pediatric Acute Care through Simulation was feasible for nurse educators to implement, led to modest engagement in all activities by nurses, and resulted in improvement in nurses' knowledge and skills. Future directions include shortening intervention time and broadening interprofessional scope.

Key words: Pediatrics; Nursing education; Telesimulation; Simulation training; Emergency nursing

Introduction

Most acutely ill and injured children are cared for in general emergency departments that concurrently care for children and adults.[1] Many general emergency departments have low pediatric patient volumes and are not well prepared to care for children, as noted by low weighted pediatric readiness scores (WPRSs) and in challenges with balancing pediatric and adult educational topics, resulting in variability in the quality of pediatric care.[2-5] Nurse educators have 2 distinct audiences/learner groups for their pediatric education: experienced nurses requiring continuing education and initial training for new graduates starting in practice. Prepandemic pediatric education in general emergency departments typically involved nurses participating in high-quality, intensive 8- to 16-hour pediatric courses, through organizations such as the Emergency Nurses Association (ENA) (Emergency Nursing Pediatric Course, Emergency Severity Index Pediatric Triage Course, Certified Pediatric Emergency Nurse Course)[6] and the American Heart Association (Pediatric Advanced Life Support, Pediatric Emergency Assessment Recognition and Stabilization).[7] In addition, an increasing number of online asynchronous continuing education activities, such as those offered through ENA University, have been created for emergency nurses.[8] Emergency nurse educators often augmented these courses and asynchronous activities with in-person educational activities including bedside education, lectures, simulations, skills-training, competency fairs, and workshops.

The pandemic created many new challenges for nurse educators, including financial cuts, the need to prioritize COVID-19 related topics, limitations in staffing with an increase in travel nurses, increasing burnout among emergency nurses, and physical distancing rules limiting traditional in-person educational activities.[9-11] Additional challenges specific to pediatric education during the pandemic included limited or no access to the existing in-person courses (Emergency Nursing Pediatric Course, Pediatric Advanced Life Support) and further reductions in pediatric patient volumes.[12-15] As the pandemic persisted, nurse educators reached out to our Improving Pediatric Acute Care through Simulation (ImPACTS) collaborative with requests for ideas and resources to conduct pediatric education in the face of barriers created by the pandemic. ImPACTS is a national network of children's hospitals collaborating with general ED physician and nurse educators to improve the quality of pediatric care.[16,17] The ImPACTS network involves a hub-and-spoke model of continual collaboration including in situ simulation, education, and quality improvement initiatives among 36 children's hospitals (the ImPACTS regional "hubs") and over 200 local general emergency departments (the "spokes"). Prepandemic ImPACTS involved collaborations between nurse educators in general emergency departments with their regional hub ImPACTS teams to implement pediatric educational and improvement efforts. A cornerstone of the ImPACTS program is that the team aims to work collaboratively "with" the nurses in these emergency departments and not work "on" them. These ImPACTS projects involved hub sites physically traveling to regional spoke community emergency departments to collaborate on in situ pediatric simulation, pediatric acute care

TABLE 1
Learning objectives

Team-centered care	➢ Verbally describe necessary staff, equipment, and resources to care for a seizing pediatric patient recognizing pediatrics status epilepticus
	➢ Demonstrate effective teamwork and communication
	○ Shared mental model
	○ Directed orders
	○ Closed loop communication
Family-centered care	➢ Demonstrate family-centered care via
	○ Obtain the appropriate history from a family member
	○ Address family concerns
	○ Keep the family updated
Clinical knowledge	➢ Describe the initial management of an acutely ill pediatric patient
	○ Prioritize airway, breathing, circulation
	○ Describe first line diagnostics and therapies with alternate route (intranasal vs intramuscular)
	○ State need for transfer to tertiary pediatric care center

education, and pediatric quality improvement initiatives. Scholarship on ImPACTS projects has demonstrated improvements in pediatric emergency readiness and improved adherence to evidence-based guidelines during the care of simulated critically ill pediatric patients in participating general emergency departments.[18-21]

In response to requests from ImPACTS affiliated nurse educators, ImPACTS collaborated with our general emergency nursing colleagues to initiate a project with 3 main goals: (1) to collaborate with general emergency nurse educators on the development and implementation of a curriculum for pediatric nursing education that could be implemented during the pandemic, (2) to determine the feasibility of the curriculum for nurse educators to administer and learners to participate in during the pandemic, and (3) to describe the effectiveness of the curriculum on improving participants' comfort, knowledge, and skills. We believed that the curriculum would be feasible for educators to implement and for participants to engage with and improve participants' knowledge and skills.

Methods

CURRICULUM DEVELOPMENT

Kern's 6 step curriculum development framework was used for this project as described below:[22]

Generalized Needs Assessment

During COVID-19, pediatric acute care was identified as an educational gap for general emergency nurses by existing nurse educators or pediatric emergency care coordinators (PECCs) through the ImPACTS network. This gap was attributed to the challenges articulated in the introduction section and supported by previous research.[2,23]

Targeted Needs Assessment

A targeted needs assessment was conducted via ImPACTS with a group of existing general emergency nurse educators or PECCs through phone calls, emails, and video-conferencing discussions with the central ImPACTS team. These discussions focused on specific nursing continuing educational needs and revealed a desire for targeted pediatrics topic areas as opposed to broad pediatrics content. The initial management of pediatric status epilepticus was specifically identified as a high priority topic, mirroring previous needs assessments.[23,24]

Goals and Objectives

Through the iterative process of the targeted needs assessment, specific learning objectives were identified related to the management of pediatric status epilepticus (Table 1).[25] These objectives align with the prior pediatric educational prioritization processes for emergency nurses including teamwork, clinical knowledge (triage, resuscitation protocols), and family-centered care.[25]

Educational Strategies

The selection of educational strategies centered on the need for physical distancing guidelines without in-person interactions. Educational strategies were selected based on existing guidelines that improve outcomes for resuscitation education.[26] These strategies included spaced practice (repetitive interactions over 12 weeks), contextual learning (working with local teams), feedback and debriefing (telesimulations), and innovative educational strategies (gamification, digital media). The distance learning approach with local collaboration by their nurse educator and colleagues enabled us

to meet learners and nurse educators where they were, often at home and over video-conferencing. This educational strategy allowed for repeated learning opportunities over time, created a combination of active and passive learning, and provided space for both individual and group learning.

Telesimulation was chosen to allow for an experiential simulation-based team-training while maintaining physical distancing in the setting of the pandemic.[24,27] Telesimulation has become a more readily available, safe, and cost-effective simulation platform as the pandemic has progressed as compared with in situ in-person simulation.[28-31] Distance learning also was chosen to allow for both synchronous and asynchronous learning. Participation was voluntary and limited to nurses, and recruitment was solicited by each site's nurse educator. Demographic data were collected, and pre/post knowledge tests were administered. Two telesimulation cases were created by content experts by adapting existing validated pediatric status epilepticus simulation scenarios via the American College of Emergency Physicians (ACEP)'s SimBox.[32] The cases' critical action checklists were adapted from existing pediatric seizure guidelines.[33,34] Cases were piloted by a group of interprofessional providers at 2 academic pediatric emergency medicine sites, as well as community emergency departments. The cases were intended for formative education with the goal of face, content/construct validity through prior use with ACEP SimBox and use of a pilot/feedback with iterative improvement. The telesimulations were conducted as the first and final elements of the intervention, with facilitation by a pediatric emergency nurse and another pediatric content expert (nurse or physician) as per guidelines from the International Nursing Association for Clinical Simulation and Learning,[35] the Promoting Excellence and Reflective Learning in Simulation blended framework,[36] and telesimulation debriefing best practices.[37] Author E.E.M, who served as the project coordinator, is a skilled and experienced debriefer, who trained each site's PECC before both the first and second telesimulations, was present for each telesimulation, and met with PECCs regularly. The telesimulations featured a prerecorded internet-based streamed video (see Supplementary Appendices 1-3) with an orientation, emergency medical services patch, actor with status epilepticus, and vital signs monitor, thus allowing facilitators to toggle the video stream back and forth as needed to respond to real-time interventions.[32,38] The telesimulation cases ran for a total of 30 minutes, including a prebriefing, simulation, and debriefing. Facilitators were provided with the critical action checklists to ensure that participants met the goals of initial management of pediatric status epilepticus.

In between telesimulations, nurse educators were provided with weekly free open-access medical education components of the intervention for distribution to their sites' participating nurses. This content was selected and vetted by ImPACTS content experts in collaboration with participating nurse educators before the study. This process focused on the need for content to be consistent, of brief duration (<20 minutes), of high educational quality, and of diverse instructional design. This included didactic lectures, skills demonstrations, choose your own adventure learning platforms, podcasts, learning modules, and skills demonstration (Figure 1). Recognizing that the intervention was lengthy, we attempted to provide a break during weeks 8 or 9. In addition, some pediatric educators were supported in running their own telesimulation during either of those weeks.

Implementation

Recruitment/enrollment. General emergency nurse educators from lower volume emergency departments that care for both children and adults were recruited via email to existing ImPACTS contacts and postings on ImPACTS social media channels during June and July 2020. Pediatric emergency departments and pediatric emergency nurse educators were not recruited for this project and were excluded from enrollment. A priori, we aimed to enroll general emergency nurse educators who recruited a minimum of 2 nurse participants for a total goal of 12 individual nurse participants across 6 sites. Interested general emergency nurse educators were provided details about the project as described in the intervention section above and through brief meetings with the ImPACTS project coordinator (author E.E.M). If the general emergency department had an existing nurse PECC, they served as the primary contact point. If the general emergency department did not have a PECC, they were asked to identify whether they or someone else on their team would serve as the primary contact point for the project.

Nurse Educator Role. Nurse educators were supported by the ImPACTS project coordinator who provided curricular content, training in simulation-based education, and biweekly discussion sessions. Educators facilitated but did not participate in telesimulations and did not complete evaluation metrics. Each educator recruited a minimum of 2 other volunteer nurse participants and participated in a train-the-trainer session facilitated by the study team.

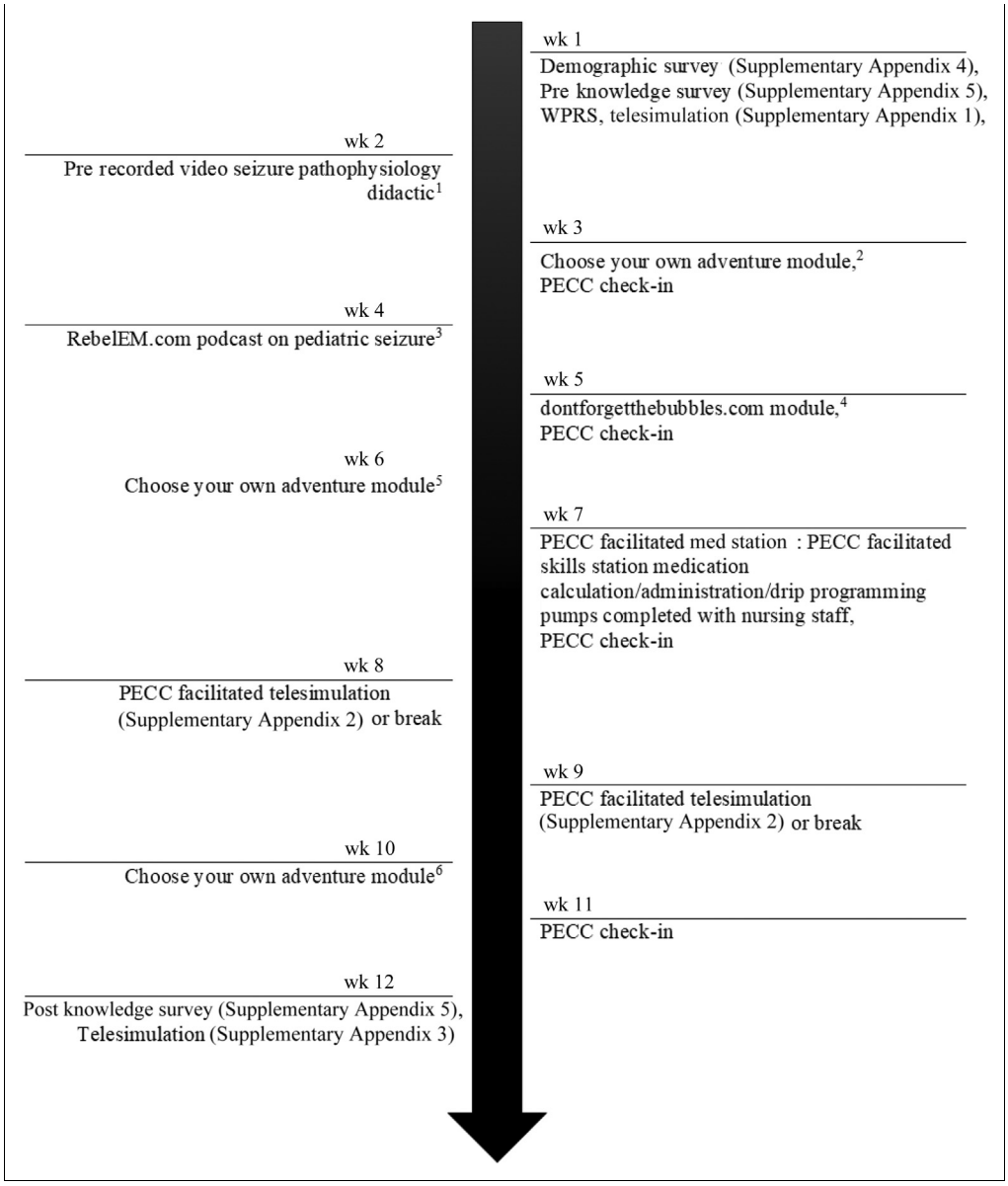

FIGURE 1

Project timeline. PECC Check-in = 30 min virtual meeting with study team and other participating PECCs.[39-44] WPRS, weighted pediatric readiness score; PECC, Pediatric Emergency Care Coordinator.

Nurse educator train-the-trainer. A 1-hour-long virtual training was conducted before the start of the intervention at each site and was facilitated by the ImPACTS project coordinator with individual or groups of participating nurse educators. The session included (1) outlining the expectations of the educators during the intervention, (2) outlining the curriculum for their learners, including a thorough review of the telesimulation platform and the expectation to review each of the weekly distance learning activities, and (3) outlining information on pediatric readiness and the National Pediatric Readiness Project (NPRP) survey that the nurse educator at each site completed during the intervention. The NPRP is a multiphase national collaborative improvement initiative aiming to ensure pediatric readiness, as measured by an emergency department's adherence to the joint policy

statement for the care of children in emergency departments endorsed by the American Academy of Pediatrics, ACEP, and ENA.[4,6,7] The project coordinator also highlighted that many emergency departments are not well prepared to care for children, as noted by their low weighted pediatric readiness score, resulting in variability in the quality and outcomes of pediatric care.[1-3] Finally, the group discussed the importance for the nurse educator to serve in the role of a nurse PECC or recruit a colleague for this position.

A nurse PECC is a registered nurse who possesses special interest, knowledge, and skill in the emergency nursing care of children.[6] The nurse PECC can come from various backgrounds and may need additional support to develop and/or implement pediatric educational activities. The nurse PECC role includes facilitating pediatric-specific elements of orientation, continuing education, and competency evaluations. In addition to pediatric education and competency, nurse PECC responsibilities can include pediatric quality improvement in the emergency department, collaborating with pediatric care committees both in hospital and out of hospital, promoting pediatric disaster preparedness, and working with ED leadership to ensure availability of pediatric equipment, resources, policies, and procedures. The PECC is designated by leadership and may have other clinical or administrative roles in the emergency department (such as an educator) and works collaboratively with the general nurse educator and physician PECC. The joint policy statement states that all emergency departments should designate both a physician and a nurse PECC.[5,6] Despite this recommendation for a designated PECC to improve pediatric readiness, only 59% of emergency departments have a nurse PECC, and 48% have a physician PECC.[5] After reviewing this, the project coordinator shared data on the association of designating a PECC with significant improvements in pediatric readiness.[5,6]

Nurse educator support/community of practice. In addition to the train-the-trainer session, educators met virtually biweekly with the project coordinator and other participating educators to address program barriers and note successes. This was used as central support for educators and as a medium for a community of practice. In this way, the study team aimed to collaborate with sites as opposed to solely providing resources.

Evaluation and Feedback

Demographic data were collected from nurse educators and each participating nurse at the start of the intervention. The nurse educator presurvey collected demographic data

TABLE 2
Pediatric emergency care coordinator/nurse educator reported presurvey

Questions	*N* = 13	%
Approximate pediatric volume per d, median (IQR)	21 (5-35)	N/A
Affiliation with AMC	6	46
PALS is required for staff	9	69
PECCs had written job descriptions and responsibilities for their role	4	31
PECCs receive dedicated time for their role	4	31
Ongoing pediatric competencies (skills and/or knowledge) exist for your emergency nursing staff	11	85
PECCs are involved in ED pediatric quality improvement initiatives	7	54
PECCs assist in review of ED policies and procedures related to standards for medication, equipment, and supplies for pediatric patients	7	54
PECCs coordinate with local pediatric credentialing processes and facilitate pediatric competency evaluations for staff	5	39
PECCs serve as a liaison on in-hospital pediatric care committees (eg, trauma, emergency preparedness)	6	46
PECCs serve as a liaison on out-hospital pediatric care committees (eg, EMS)	4	31
PECCs serve as a liaison to local definitive care hospitals to integrate services along the pediatric care continuum	4	31
PECCs facilitate the inclusion of pediatric-specific elements to new ED staff on orientation	9	69
PECCs facilitate the integration of pediatric needs in-hospital disaster planning	3	23
PECCs collaborate with ED leadership to enable adequate staffing, medications, equipment and supplies, and other resources for children in the ED	8	62
PECCs have access to needed resources to adequately perform as a PECC in the ED	9	69
Pediatric simulations occur in the ED	9	69

IQR, interquartile range; AMC, academic medical center; PALS, pediatric advanced life support; PECC, Pediatric Emergency Care Coordinator; ED, emergency department; EMS, emergency medical services; N/A, not applicable.

TABLE 3
Pediatric emergency care coordinator/Nurse educator post survey

Questions	*N* = 10	%
How much pediatric-specific education was provided to your nurses pre-ImPACTS nursing distance learning collaboration?		
1-5 h per y	5	50
6-10 h per y	3	30
>10 h per y	2	20
Do you expect to conduct pediatric education in the coming year?		
Yes	10	100
If yes, do expect to conduct:		
The same amount of education as before	1	10
More education than before	9	90
Has your participation in the ImPACTS distance learning detracted from other nursing education?		
No	10	100
Was 12 weeks of curriculum		
Just enough	6	60
Too much	4	40
Do you have access to the resources you need to perform as a PECC in your ED?		
Yes	9	90
No	1	10
On a scale from 0-10, how likely are you to recommend the ImPACTS distance learning collaborative to a colleague? Median (IQR)	9 (8-10)	N/A

ImPACTS, improving pediatric acute care through simulation; PECC, Pediatric Emergency Care Coordinator; ED, emergency department; IQR, interquartile range; N/A, not applicable.

on the PECC role and ED characteristics and was completed with remote support from the project coordinator (Table 2). All sites had PECCs and had previously engaged with the ImPACTS collaborative with a median daily pediatric volume of 21. Whereas 11 of 13 or 85% of PECCs currently have ongoing pediatric competencies for emergency nursing staff, 5 of 13 or 39% coordinate with local credentialing processes and facilitate competency evaluations for staff that are pertinent to children of all ages. In addition, 9 of 13 or 69% of PECCs reported having access to resources needed to perform as a PECC, and only 4 of 13 or 31% reported having dedicated time for their PECC role and a written job description/responsibilities (Table 2). Data collected from nurse participants included years worked as a registered nurse, years worked as a registered nurse in the emergency department, approximate number of pediatric patients cared for per month, amount of pediatric education prior to this intervention, and whether the participant had ever worked in a pediatrics only role (Supplementary Appendix 4).

Feasibility measures. Feasibility was measured as (1) engagement and retention of ED educators and (2) the engagement and retention of nurse participants at each ED site. Additional data were collected on the time required of the educator for this work and rates of participants completing some or all interventions and/or evaluations. Educators engaged in biweekly check-ins, where feedback was solicited on implementation and opportunities for improvement. Educator postintervention surveys were collected to measure their activities and experiences (Table 3). Completion of individual educational activities by each learner was documented using a unique anonymous identifier. After each educational activity, learners reported their satisfaction, measured with a net promoter score for each activity, and had the opportunity to provide feedback on how to improve the intervention in free text. These site-specific data were provided to educators at each emergency department to track their learners' participation and support local implementation efforts. Overall site curriculum completion was defined as completion of pre/post telesimulations while educators remained engaged with central ImPACTS support via biweekly check-ins. Individual learner curriculum completion was defined as completion of the entire online curriculum with pre/post telesimulations as set forth in Figure 1, demographic/comfort survey completion, and pre/post knowledge survey completion.

Effectiveness measures. Satisfaction, comfort, and knowledge were measured through pre- and postintervention surveys. We used Likert scales to measure comfort with the demographic survey (Supplementary Appendix 4) and multiple-choice questions to measure knowledge (Supplementary Appendix 5). Responses were tracked via anonymous identifiers. Skills were measured using a 5-item critical action checklist of performance during the initial and final telesimulations (Supplementary Appendices 1 and 3).

Analyses. All data were manually entered into Qualtrics (Qualtrics, LLC, Provo, UT) and transferred into SPSS (v. 27.0; IBM Corp, Armonk, NY), with which all

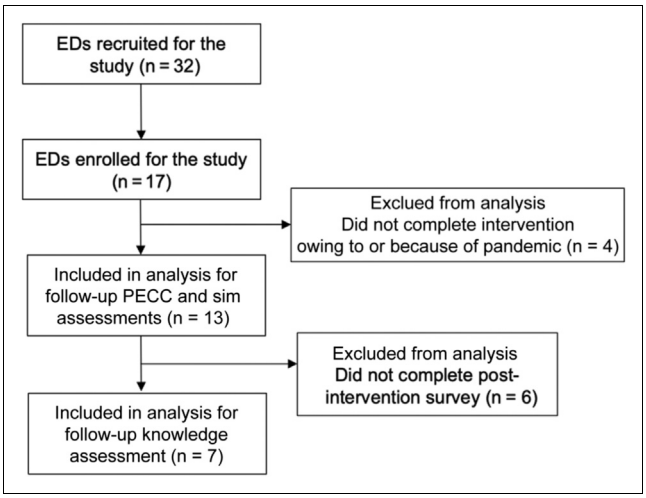

FIGURE 2

Study flow diagram: general emergency departments recruited. PECC, Pediatric Emergency Care Coordinator; ED, emergency department; sim, simulation.

statistical analyses were performed. Descriptive statistics (eg, frequencies, histograms, means, standard deviations, medians, interquartile ranges) were conducted for key demographics and variables. Additional bivariate analyses were conducted to examine differences in simulation performance and knowledge surveys pre- versus postintervention. These were conducted using Wilcoxon signed-rank tests. This study received institutional review board exemption by Riley Children's Hospital institutional review board.

Results

Thirty-two general ED sites were identified through recruitment efforts. Of these, 17 sites identified a nurse educator who connected with the ImPACTS project coordinator at least 1 time, and 13 sites completed the full intervention (Figure 2) via engaging in the pre and post telesimulation and maintaining central ImPACTS biweekly check-ins. Individuals from 7 of these sites completed the pre-post telesimulation and the pre-post knowledge surveys. These general emergency departments were geographically distributed across the United States and Canada. A total of 110 nurse learners started the curriculum, whereas 38 nurses (35%) completed the entire curriculum as defined by adherence to all elements of the entire curriculum including pre and post telesimulations and completing the pre and post knowledge survey with nurse learners per site (but did not complete week 10 educational activity). Twenty-two learners (20%) completed all the educational activities, including week 10.

NURSE EDUCATOR ACTIVITIES

All 13 general emergency departments were included in the analysis for follow-up nurse educator, with self-reported nurse educator demographics described in Table 2. The postintervention nurse educator survey was completed by 10 of the 13 nurse educators who completed the curriculum (Table 3). Nine out of 10 of those respondents reported that over the intervention period, they had delivered more pediatric education than before, with 100% reporting that the ImPACTS distance intervention did not detract from other nursing education. Sixty percent reported that 12 weeks of intervention was just enough, and the remainder reported that it was too long, with many PECCs verbally reporting to the central ImPACTS team that 12 weeks was too long for sustained engagement. Ninety percent or 9 of 10 also reported that they had access to resources needed to perform as a PECC as compared with 69% or 9 of 13 before intervention (Tables 2 and 3). Most PECCs would recommend the ImPACTS telesimulation nursing intervention (median of 9 on scale of 1-10, interquartile range [IQR] 8-10) (Table 3).

During biweekly check-ins, many nurse educators verbally reported to the program coordinator that it was unrealistic to limit this educational platform to nurses as typically, a provider such as an advanced practice provider or a physician would be present for all pediatric resuscitations from the beginning, regardless of how busy the emergency department might be. In addition, verbal feedback was consistently provided that 12 weeks was too long for asynchronous education on one specific topic. Finally, no sites filled out a subsequent WPRS as they had not solicited any changes during the educational intervention, so it was primarily used as a demographic measure.

LEARNER FEASIBILITY

Learner participation in weekly asynchronous learning activities waned over the course of the intervention from an initial 60% of participants completing weekly learning activities in weeks 2 and 3 to 20% of participants completing all activities in week 10.

LEARNER EFFECTIVENESS

Knowledge

Of the 110 learner nurse participants, 69 learner nurse participants (63%) filled out preintervention knowledge survey, and 38 learner nurse participants (35%) completed the post knowledge survey (Figure 3A). Intervention

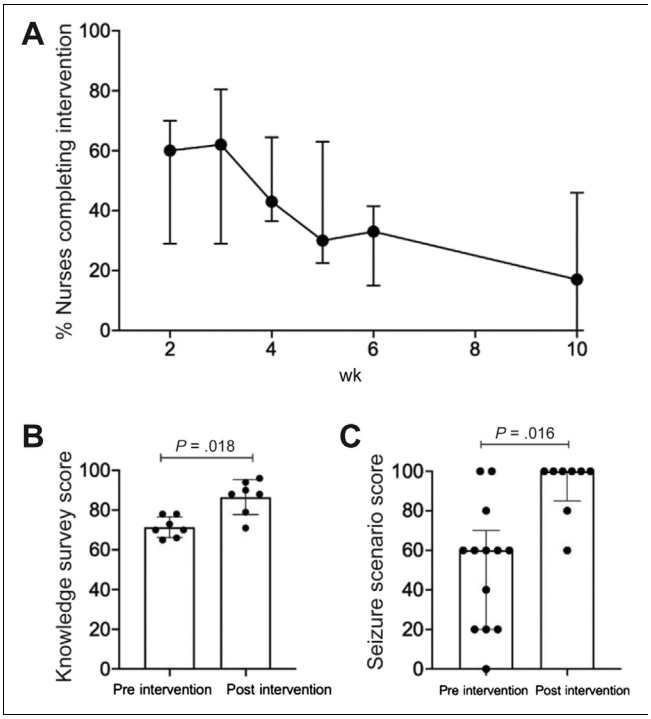

FIGURE 3

Implementation and pre vs post knowledge and simulation performance. (A) Percent of nurses completing the intervention over time implemented. (B) Knowledge survey scores pre and post intervention. (C) Telesimulation Seizure Scenario score pre and post intervention.

knowledge improved significantly ($P = .018$) from preintervention (median 70, IQR 66-78) to postintervention (median 88, IQR 79-94) (Figure 3B).

Seizure Telesimulation Skills

Thirteen sites completed the initial preintervention telesimulation, and 8 completed the postintervention telesimulation. Of these, telesimulation scenario critical actions team checklist performance demonstrated overall significant improvement ($P = .016$) in median score from 60 (IQR: 45-60) to 100 (IQR: 85-100) (Figure 3C, Table 4).

TABLE 4

Seizure telesimulation scenario team performance as emergency department level outcome

Critical actions	Preintervention		Postintervention	
	n = 13	%	*n* = 8	%
1. Verbalize airway response in first minute	7	54	8	100
2. Verbalize glucose check-in first 3 minutes	5	39	7	88
3. Verbalize correct dose of LORazepam IV/IO as first line agent	9	69	8	100
4. Verbalize correct dose of midazolam	3	23	6	75
5. Verbalize need for second line agent	10	77	8	100
TOTAL seizure score	Median = 60 IQR = 45-60		Median = 100 IQR = 85-100	
P value	0.016			

IQR, interquartile range; IV, intravenous; IO, interosseous.

Discussion

A distance educational curriculum on pediatric status epilepticus collaboratively developed and implemented by pediatric nurse educators with ImPACTS, targeting general emergency nurses during the COVID-19 pandemic, was feasible for general emergency nurse educators to implement. At the level of the individual nurse participant, a 12-week curriculum was not feasible for most participants to complete. Nurses who completed the curriculum had improvements in knowledge and skills, aligned with our study learning objectives. Pediatric nurse educators or PECCs reported that 85% had ongoing pediatric competencies in their general emergency departments before COVID-19; however, nurse educators reported that although pediatric training was available, it was currently stalled secondary to the pandemic. Optimistically, after our study, nurse educators reported that they would facilitate more pediatric educational activities for nurses and would recommend the telesimulation and distance learning. This supports that the curriculum was well regarded and generated more interest in pediatric education among participating PECCs (Table 3). Nurse educators also reported that the intervention did not detract from already available education (Table 3); thus, it can be a useful asynchronous and cost-effective intervention to augment traditional in-person courses, simulations, and didactics as we emerge from the pandemic. The a priori goal of at least 6 sites completing the intervention was met, with a total of 13 sites initially enrolled and 8 completing the final telesimulation. Ideally, we would see 100% completion of the entire curriculum,

but of the 110 nurses initially enrolled throughout the 13 sites, 38% completed most activities (except week 10), and 20% completed all interventions (including week 10). It is unclear why week 10 was not uniformly completed, perhaps secondary to it being the third "choose your own adventure" module during the 12-week intervention. Despite waning participation from 63% to 35% over the 12-week intervention, a statistically significant improvement was seen in postintervention knowledge of status epilepticus, as well as telesimulation critical action performance in those who completed these activities (Figure 3).

Limitations

We identified 5 major limitations to this work. First, recruitment and engagement of nurse educators and learners were likely confounded by provider burnout, financial strain, and provider turnover during the COVID-19 pandemic. Second, although our team engaged emergency nurse educators in the needs assessment, development, and implementation process of this work, the inter-team power dynamics may not have sufficiently empowered these educators, limiting their input. An example of these dynamics includes physician-nurse and academic-community interactions. This may have contributed to the low nurse participation, but this topic was not explicitly raised by nurse educators. Future efforts should work to enhance the authentic input from emergency nurse educators and nurses in every stage of the development, implementation, and iterative improvements. Third, this study involved nurse educators previously involved in ImPACTS work before the pandemic; thus, there was selection bias, and our findings may not be generalizable to "new" collaborations between general emergency departments and regional hubs. As PECCs were solicited from previous ImPACTS work, they would have already filled out the WPRS during previous ImPACTS collaborations, which likely explains why changes were not made and the score not filled out again at the conclusion of the intervention. Fourth, participants served as their own pre- and postintervention controls. Ideally, in future iterations, we can consider comparing (1) nurse performance at institutions with and without a PECC, (2) nurse performance without going through the intervention at a "control" site, or (3) nurse performance within a traditional simulation setting versus telesimulation curriculum to test the effectiveness of our designed curriculum/intervention. Finally, there was a low completion rate with a complex set of reasons. Not all participants completed the pre- and postintervention knowledge surveys, with a large decrease in participation with the postintervention knowledge survey. Waning participation in the study may be attributable to the intervention itself (length, topic, content) and/or COVID-19–related events (surges in other patients, reassignment of staff, staffing turnover). In response, we hope that future interventions will iteratively improve curriculum and specifically query frontline nurses regarding barriers to completing activities (in addition to the length and heavy clinical loads reported to the study team as contributing factors by PECCs during check-ins). Limiting this intervention to nurses was reported by participants as unrealistic; thus, the next iteration will include a physician or advanced practice provider to ensure fidelity. Technology failure and participant inexperience with video-conferencing and telesimulation also could have impacted the team; therefore, for future iterations, we will incorporate a prebrief on how to best use video-conferencing platforms and to delineate the needed technology. This study also did not evaluate actual clinical outcomes of real pediatric patients who presented in status epilepticus at the sites; however, it could be an outcome to evaluate in future studies.

Future Directions and Lessons Learned

Collaboration between pediatric nurse educators such as PECCs and regional academic medical center hubs on pediatric curriculum development and implementation could be generalizable to other emergency constructs. In addition, this type of collaboration could serve as a virtual community of practice for nurse educators and nurses to share educational resources with each other. Our outcomes of engagement of nurse educators in this project are well aligned with the existing pediatric readiness joint policy statement role of a nurse PECC—specifically, nurse PECC roles involving supported provider competency and education in the readiness for care of the acutely ill pediatric patient and collaboration with regional academic medical centers with ImPACTS biweekly check-ins.[18] We hope that this maturation of the relationships between nurse educators across general emergency departments and between nurse educators and regional ImPACTS hubs can serve as a model for continued collaboration in this group in the future. General emergency departments with nurse educators were targeted in this intervention as the NPRP joint policy recommends the presence of a PECC. We recognize that many general emergency departments nationally may not have a designated emergency nurse educator or PECC. Although our program may be of benefit to general emergency departments without educators and/or PECCs, we did not test it in that setting. We have reflected on the lessons learned from this project and have iteratively improved our intervention, and it is currently being implemented in another cohort. The next iteration involves a

shortened duration from 12 weeks to 5 weeks to improve adherence, added requirement for an interprofessional participation (physician or advanced practice provider), and a new virtual interactive telesimulation platform as an alternate and more realistic modality. In addition to guiding the development and implementation of ImPACTS work, we hope that this work will inspire others to consider collaborative distance learning curricula in general emergency departments.

Implications for Emergency Nurses

This collaborative method of development and implementation of an asynchronous distance learning curriculum can be used by emergency departments as a method for continuing nursing pediatrics education to improve knowledge and critical clinical action performance. As we emerge from the pandemic, we hope that emergency nurse educators will consider collaborative asynchronous education and telesimulation to augment their existing educational activities. Telesimulation has become more common as the COVID-19 pandemic has limited in-person educational opportunities, and this work demonstrates that it is a well-received and cost-effective instructional strategy that can be considered by educators after the pandemic and in low resource settings. In-person hands-on simulation will continue to be needed for tasks such as drawing up appropriate medication doses, placing an intravenous catheter, or finding equipment in the department. The educational materials used for this feasibility project are available as appendices, through the ImPACTS website, and via direct email contact with the study team.[17] It is important to note that this work was not intended for pediatric emergency departments or pediatric-specific settings with specialized pediatric emergency nurse specialists. The level of content for work targeting that group of nurses would likely need to be more advanced.

Conclusion

A longitudinal pediatric distance learning curriculum for general emergency nurses collaboratively developed and implemented by general emergency nurse educators with ImPACTS was feasible and resulted in improvements in nurses' knowledge and skills. The novel components of this work included the collaboration, telesimulation, and diverse asynchronous instructional strategies to provide alternative methods for continuing pediatric education for general emergency nurses during the COVID-19 pandemic. Future directions include shortening intervention time and broadening interprofessional scope.

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Author Disclosures

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Supplementary Data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.jen.2022.09.001.

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Implementing a Resilience Bundle for Emergency Nurses: An Evidence-Based Practice Project

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Contribution to Emergency Nursing Practice

- What is already known about this topic? Although a bundle strategy for enhancing resilience is a relatively new concept, several recent studies show promising results.
- What does this paper add to the currently published literature? Implementation of Resilience bundles can function within existing workflows, can be low cost, and can be specially designed for each unique nursing environment.
- What is the most important implication for clinical practice? Implementation of resilience bundles has been shown to be effective in enhancing resilience.

Abstract

Introduction: Resilience bundles are designed to work within and enhance existing routines. In the wake of COVID-19, nurses are reporting high levels of burnout and are leaving the field at an alarming rate. Hospital system leaders across the country are working to develop wellness programs to improve nurse morale, decrease burnout, and enhance resilience. Resilience can help mitigate nurse burnout, and using a bundle of tools to help nurses develop resilience is more effective than a single strategy.

Methods: Using the Connor-Davidson Resilience Scale-10 and the Perceived Stress Scale 4, emergency nurses were surveyed to measure resilience and stress before and after implementation of a 3-strategy resilience bundle. We surveyed at baseline, phase 1 (6 weeks after implementation), and phase 2 (15 weeks after implementation).

Results: A statistically significant increase in the Connor-Davidson Resilience Scale-10 scores was identified between the baseline and phase 1 surveys. A measurable decrease in the Perceived Stress Scale 4 was found between the baseline survey and the phase 1 and phase 2 postintervention surveys.

Discussion: Although evidence suggests a multifocal approach to improving resilience, use of resilience bundles is new. To enhance nurse resilience and mitigate burnout, nurse leaders may consider resilience bundles to prioritize the mental health and wellness of their staff.

Key words: Resilience; Bundle; Burnout; Stress; Emergency nursing

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Introduction

Emergency nurses experience considerable stress and numerous emotionally exhausting events in their role.[1] Emergency departments are frequently challenged with high levels of nurse turnover due to burnout and compassion fatigue, leading to a vicious cycle of highly stressed and emotionally exhausted nurses working in understaffed environments.[2-4] Interventions that focus on building resilience can mitigate nurse burnout, which can help to reduce compassion fatigue and nurse turnover.[5-7]

Burnout affects nurses around the world and is described as mental and physical fatigue[8] associated with decreased job

satisfaction, depression, anxiety,[9] poor job performance, and nursing turnover.[10] Emergency nurses are particularly prone to burnout because of the nature of emergency clinical care. Emergency nurses experience highly emotional situations frequently during their shifts, such as caring for trauma patients and observing fatalities.[2]

Nurse burnout and stress negatively impact clinical outcomes, nurse turnover, and patient experience.[11] The International Council of Nurses[12] reported that 80% of nursing organization leaders are concerned about the burnout and exhaustion experienced by the nursing workforce. In addition, the Joint Commission[13] reported that emergency nurses are at higher risk of burnout than nurses in many other fields. Nurses who experience burnout are at risk of developing psychological and physical problems including depression, impaired memory, musculoskeletal pain, and compassion fatigue.[13,14] In nurses, increased burnout also is associated with higher levels of absenteeism and turnover, substance abuse disorders, and even suicide.[13,14]

Before the COVID-19 pandemic, about 40% of United States nurses reported experiencing burnout at some point in their career.[6,15] The COVID-19 pandemic brought new challenges, fears, and stressors to the nursing profession. Inadequate personal protective equipment, increased patient-to-nurse ratios, and higher acuity patients are examples of the added stressors that undoubtedly increased nurse burnout.[16] Foli et al[16] study of nurses' experiences during the COVID-19 pandemic revealed alarming numbers of nurses reporting anxiety, depression, and increased substance use.

In addition to burnout, emergency nurses are experiencing compassion fatigue, vicarious or secondary trauma, and second-victim trauma.[16] Compassion fatigue is (a) a loss of the ability to nurture and/or (b) apathy that results from repeated exposure to tragedy and absorbing the suffering of others.[17] Repeated exposure to high stress and emotional exhaustion leads to compassion fatigue and burnout in emergency nurses.[2] Emergency nurses frequently care for patients in acute distress who are suffering traumatic injuries, all while coping with overcrowded, fast-paced environments. Repeated exposure to this environment may lead to compassion fatigue.[18] Vicarious or secondary trauma is defined as the accumulation of acute and chronic trauma experienced through witnessing others trauma.[16] This trauma effects how nurses make decisions both at work and in their personal lives. Second-victim trauma is the trauma that may be experienced after an adverse event, poor outcome, or medical error.[13,16]

RESILIENCE

Resilience is the ability to adjust to adversity, retain a sense of control, and maintain positivity.[6,7] Resilience is a learned trait that can be fostered and enhanced.[6,7,13,19-21] Increasing resilience in nurses decreases nurse burnout and compassion fatigue[3] and improves nurse-sensitive indicators for quality patient care.[5,10]

In their position statement on emergency nurse duty hours and patient safety, the Emergency Nurses Association[22] recommend that nurses and leaders implement strategies to increase nurse resilience. Enhancing the resilience of emergency nurses increases their joy in the workplace,[23] the Institute for Healthcare Improvement's fourth aim in the Quintuple Aim.[24] Furthermore, improving joy in the workplace decreases turnover rates and improves patient safety and quality.[23] Increasing resilience is one way to improve joy in the workplace.[23]

RESILIENCE BUNDLE

Although a bundle strategy for enhancing resilience is a relatively new concept, several recent studies show promising results.[15,25-28] The evidence supports the use of multimodal approaches for increasing nurse resilience.[13,25,29,30] A single approach rarely benefits all nurses equally[31]; therefore, implementing a bundle of evidence-based interventions is considered most effective.[32] The elements for the bundle were selected after evaluation of available knowledge and consideration of sustainability and ability to implement at the project site. Creating a serenity room,[2] using structured debriefing,[3] and implementing a program of relaxation and mindfulness[33] have each been shown to promote resilience in nurses.

SERENITY ROOM

The allocation of a small space (serenity room) for relaxation and restoration during work allows staff to relax and refresh. The serenity room provides a quiet space for taking breaks at work, which is advantageous because work breaks promote self-care and replenishment and reduce fatigue.[13,34] An employer's commitment to creation of this space also sends a positive message to staff that their well-being is important and valued by the organization.[2,13]

STOP 5 debriefing form
first ask "Is everyone okay?"
If yes, then continue: debrief should take approximately.5 min
(Form adapted from STOP 5, Walker et al., 2020)

Summarize (type of event or situation)	
Things that went well	
Opportunities for improvement	
Points for action	

CN:_____ Date and time_____

Participants:_____
_____
_____

Any additional remarks:
_____
_____
_____
_____

FIGURE
Resilience bundle debrief form. CN, Charge Nurse. Adapted from Walker et al.[33]

DEBRIEFING

The Emergency Nurses Association[22] position statement on healthy work environments cites debriefing as an integral component of a healthy work environment. Debriefing is the facilitated reflective process of the interprofessional team involved in a critical event.[35] Debriefing builds resilience through helping nurses to better understand their own emotions and experiences through social connectedness and group bonding.[3]

MINDFULNESS

Mindfulness is defined as being present in the current moment[36] in mind and body to reduce stress and anxiety, improve focus, and decrease burnout.[37] Promoting positivity through mindfulness moments increases resilience.[33] Mindfulness activities may include a few minutes of quiet deep breathing, coloring, or journaling. Learning to practice mindfulness while at work can help nurses to focus their attention on the work at hand. Moreover, learning this skill

TABLE 1
Serenity room items and cost for an emergency department

Resource	Quantity required	Cost per each ($)	Total cost ($)
Massage chair	1	0 (donated by Foundation)	0
Aromatherapy diffuser	1	15	15
Sound machine	1	20	20
LED candles	1 pack of 9 candles	20	20
Vacant or occupied sign	1	10	10
Fluorescent light cover	2	35	70
Tranquil tapestry or wall art	1	30	30
Total cost			~165

LED, light-emiting diode

also can benefit nurses by teaching them how to focus attention and be engaged with family.[34]

PROBLEM

The project site is a level I trauma center with 66 ED beds with approximately 77,000 ED visits per year. The emergency department employs approximately 120 registered nurses, ranging from graduate nurses to nurses with more than 20 years of experience. The emergency department's turnover rate for nursing staff was 16.7% in 2019, 17.4% in 2020, and 33% in 2021. The unit is understaffed about 10% of the time, increasing workplace stress. Although resilience has been shown to reduce burnout, compassion fatigue, and nurse turnover,[5-7] This emergency department had no strategies in place to improve resilience in nurses who work in the department. At the time of this project, the hospital had recently begun efforts to enhance clinician resilience through the addition of a serenity room at the center of the hospital, approximately a 7-minute walk from the emergency department. The objective of this evidence-based practice implementation was to increase resilience levels of emergency nurses. Permission was obtained by hospital administration to implement the project. The Texas Tech University Health Sciences Center Quality Improvement Review Board determined that this project was categorized as evidence-based implementation and evaluation and did not meet the definition of human subjects research or quality review; thus, this project was exempt from further institutional review.

Methods

This was an evidence-based practice project. Interventions were selected after review of available literature and discussion with ED administration. The 3 elements of the resilience bundle implemented for this project were (a) mindfulness and relaxation techniques added to daily shift huddles; (b) structured debriefing led by charge nurses after a death on the unit, a highly stressful or emotional event, or at the charge nurse's discretion; and (c) a serenity room, designed and developed for the use of all ED employees.

Education for the charge nurse team about the project was provided at the monthly charge nurse meetings in August 2021 and September 2021. The charge nurse team, consisting of 13 nurses at the time of project implementation, was taught by the lead author to lead mindfulness activities and reflective debriefing. The charge nurse team received a copy of Practicing Mindfulness by Matthew Sockolov,[38] as well as the Mindfulness Game by Innericons,[39] to use as prompts for mindfulness-based activities during shift huddles. These items were selected by the primary author after review of available materials. Posters teaching and encouraging mindfulness were hung throughout the unit. We used Walker et al[40] STOP 5 (Summarize, Things that went well, Opportunities for improvement, Points for action) debrief method and provided copies for the charge nurse to use for debriefing sessions (see Figure). ED administrative staff designated and transformed an unused room in the emergency department to a serenity room. The project site Foundation donated the funds for a massage chair for the emergency department. The remaining items for the serenity room were donated by the first author. A list of items and cost may be viewed in Table 1.

Before implementation of the resilience bundle, a link to a Qualtrics (Provo, UT) survey was emailed to all emergency nurses at the project site, including bedside staff nurses, the charge nurse team, and emergency nurse administration through their employee email accounts. When fully staffed, the emergency department employs approximately 120 full-time equivalents of nurses. The survey consisted of 5 demographics questions (see Table 2), the Connor-Davidson Resilience Scale 10 (CD-RISC-10), and the Perceived Stress Scale 4 (PSS4). Permission was obtained to use the CD-RISC-10 survey, and permission was not required for use of the PSS4.

The CD-RISC-10 is a valid and reliable tool ($\alpha = 0.93$)[41,42] with 10 self-assessment statements and scoring that ranks each item from not at all true (0) to true nearly all the time (4). CD-RISC 10 scores range from 0 to 40: the higher the score, the higher the resilience. The PSS4 is a valid and reliable self-assessment ($\alpha = 0.81$) used to measure perceived stress.[43] This 4-question survey scores statements on a Likert-type scale ranging from Never (0) to Very Often (4). The total score range is 0 to 16, with higher scores on the PSS4 indicating higher levels of stress.

Phase 1 data were collected via Qualtrics survey 6 weeks after implementation of all elements of the resilience bundle (insert dates). Phase 2 data were collected via Qualtrics survey 15 weeks after implementation. In addition to the questions in the baseline survey, phase 1 and phase 2 surveys also contained qualitative questions about the use of each of the elements of the bundle and an open-ended question for additional feedback. Qualitative questions asked whether the participant used each element of the bundle and whether they found it useful. IBM SPSS Statistics 25 was used to analyze data.[32] Demographic data were analyzed using descriptive statistics. The Kruskal-Wallis test (KW) and the Mann-Whitney U test were used to test for differences among baseline, phase 1, and phase 2 survey data. The project team elected not to use paired samples owing to high nurse turnover rate. For each survey phase, the survey link was available for 2 weeks.

TABLE 2
Characteristics of emergency nurses who experienced the implementation of a resilience bundle

Characteristic	n (%)
Age group (y)	
18-20	2 (2.1)
21-30	45 (46.9)
31-40	35 (36.5)
41-50	12 (12.5)
51-60	2 (2.1)
Gender	
Male	6 (6.3)
Female	86 (89.6)
Prefer not to respond	4 (4.2)
How many y have you been a nurse?	
<1 y	9 (9.4)
1-3 y	21 (21.9)
4-9 y	36 (37.5)
10-15 y	18 (18.8)
16-20 y	9 (9.4)
>20 y	3 (3.1)
How many y have you been an emergency nurse?	
<1 y	17 (17.7)
1-3 y	24 (25)
4-9 y	32 (33.3)
10-15 y	20 (20.8)
>20 y	3 (3.1)
What is your education level?	
Diploma nurse	2 (2.1)
Associate degree	14 (14.6)
Bachelor's degree	41 (42.7)
Master's degree	17 (17.1)
Doctoral degree	15 (15.6)
Prefer not to respond	7 (7.3)

Results

Demographic characteristics of emergency nurses are displayed in Table 2. Response rates were calculated using filled full-time equivalents at the close of each survey time frame. The baseline survey had a 51% response rate, the phase 1 survey had a 30% response rate, and the phase 2 survey had a 29% response rate. Normality and uniformity (Poisson) of the summative score continuous variables were tested with the Kolmogorov-Smirnov test. None of the summative scores tested were normally or uniformly distributed. The Mann-Whitney U test was used to compare mean ranks of 2 groups, and KW test was used to compare 3 groups of non-normally distributed summative score data. The threshold of probabilistic significance for differences in comparisons was set at the level of 0.05. Incomplete surveys were excluded from analysis.

TABLE 3
Descriptive data of CD-RISC-10 and PSS4 across survey phases

Variables	CD-RISC-10			PSS4		
	Baseline	Phase 1	Phase 2	Baseline	Phase 1	Phase 2
Survey dates	September 9, 2021-October 11, 2021	November 22, 2021-December 5, 2021	January 1, 2022-January 20, 2022	September 27, 2021-October 11, 2021	November 22, 2021-December 5, 2021	January 1, 2022-January 20, 2022
N	47	26	23	47	26	23
Mean	29.96	32.31	30.17	8.91	8.92	8.78
SD	4.96	6.16	5.65	1.53	1.79	1.70
Median	29	32.5	30	9	9	9
Range	20-40	17-40	20-40	3-13	4-13	6-12

CD-RISC-10, Connor-Davidson RISC-10; PSS4, Perceived Stress Scale 4.

Because the data were not normally distributed, we used the KW test and found no statistically significant differences in CD-RISC-10 scores across the 3 groups (N = 96, KW = 3.78, df = 2, $P = .08$). CD-RISC-10 scores increased from baseline ($n = 47$, median [Md] = 29, interquartile range [IQR] = 27-34) to phase 1 ($n = 26$, Md = 32.5, IQR = 28.75-38) and from baseline (n = 47, Md = 29, IQR = 27-34) to phase 2 ($n = 23$, Md = 30, IQR = 25-35). After further investigation, we found that the mean rank of the CD-RISC-10 score was significantly higher ($n = 26$, mean rank [MR] = 43.44, SD = 6.16) in phase 1 than at baseline ($n = 47$, MR = 33.44, SD = 4.96) in a 1-sided Mann-Whitney U test ($n = 73$, $U = 778.500$, $P = .03$). See Table 3 for results.

A total of 5 open-ended comments (56%) were favorable, and 44 open-ended comments (44%) were unfavorable (see Table 4). An example of a favorable comment was, "It was awesome." An example of an unfavorable comment was, "Serenity rooms are useless if there's no time to utilize them." The mean rank of the perceived stress score was measurably lower in the combined postintervention group (phase 1+2, $n = 49$, MR = 46.27, SD = 2.34) than in the pre-intervention group ($n = 47$, MR = 50.83, SD = 2.8) but was not significantly different in a Mann-Whitney U test (N = 96, $U = 1{,}042.000$, $P = .42$, $z = -0.425$).

Discussion

Implementation of a resilience-building bundle produced a statistically significant increase in resilience among emergency nurses from baseline ($n = 47$, MR = 33.44, SD = 4.96) to phase 1 ($n = 28$, MR = 43.44, SD = 6.16) after intervention ($n = 73$, $U = 778.500$, $P = .03$). These results are similar to results found by others who implemented toolkits or bundles aimed at reduction of stress and enhancement of resilience.[25-27] The mean CD-RISC-10 score increased from baseline (M = 29.96, SD = 4.96) to phase 1 (M = 32.31, SD = 6.2). Although there was a decrease of the mean score of the CD-RISC-10 from phase 1 (M = 32.31, SD = 6.2) to phase 2 (M = 30.17, SD = 5.65), the mean for phase 2 was still higher than the baseline mean. These results suggest that the implementation of a resilience bundle may have been effective in enhancing the resilience of emergency nurses.

Davis and Batcheller[25] implementation of a resilience bundle in a pediatric intensive care unit also showed enhanced resilience over 6 months. Mintz-Binder et al[27] found that implementation of resilience-building methods, which the authors called a toolkit, improved nurse resilience

TABLE 4
Emergency nurse responses to open-ended survey question: "Any feedback you would like to share about the resilience program?"

Responses
Please Keep the Tranquility Room!! It's such a nice break from the hustle and bustle!
I appreciate Whitney focusing efforts on a staff who has been stretched too thin for too long.
Serenity rooms are useless if there's no time to utilize them.
Love the room! I'm finally able to sit and have lunch now instead of standing in a corner shoveling food in as quick as I can!
I think it's a great idea if you have time to take to stop, but there's such a rushing culture here that it's not really encouraged to stop and take time for yourself while at work.
Did not have time post shift to utilize the serenity room. Certainly did not have time during shift.
The mindfulness exercises seem tone deaf in the face of such overwhelming adversity, rather like telling someone to smile while they're drowning. The debriefing forms are somewhat better, but there is very little time or chance to complete them. The serenity room is very beautiful, from the glimpses of it I've caught running from one end of the ER [emergency room] to the other. Perhaps someday I'll have time to use it.
I would like to have more time in the serenity room.
It was awesome.

over a period of 6 weeks. In their study, nurses' resilience was measured using the CD-RISC-10 scale at baseline and after implementation of stress-reduction techniques.[27] Andersen et al[26] replicated this toolkit in an inpatient hospital setting and also found a significant increase in nurse resilience over their 3-month study period. The resilience bundle in the present study was inspired by Mintz-Binder et al[27] and Andersen et al[26] studies; however, this bundle was implemented in an emergency department and focused specifically on resilience of emergency nurses.

Although the majority (56%, $n = 5$) of nurses who provided comments to the open-ended question were favorable (eg, "Love the room! I am finally able to sit and have lunch now" and "Please keep the tranquility room!! It is such a nice little break from the hustle and bustle!"), some nurses' comments were not favorable. One comment was particularly concerning:

> The mindfulness exercises seem tone deaf in the face of such overwhelming adversity, rather like telling someone to smile while they're drowning. The debriefing forms are somewhat better, but there is very little time or chance to complete them. The serenity room is very beautiful, from the glimpses of it I've caught running from one end of the ER to the other. Perhaps someday I'll have time to use it.

This statement illustrates a call to action for ED leaders. A resilience bundle cannot function as a Band-Aid and cannot replace adequate staffing and emotional support from leadership. It is vital that organizations and health care leaders prioritize the mental health and well-being of their staff.[13] In order to retain nurses and improve staffing conditions, hospital leaders must provide safe working conditions, support nurses' health and well-being, and develop and sustain a culture of safety.[13,44,45]

Project Barriers and Limitations

Baseline surveys were distributed during a small COVID-19 surge at the project site, which may have reduced response rates. Phase 1 and 2 surveys were distributed during a large COVID-19 surge at the project site, when patients diagnosed with COVID-19 were occupying >30% of hospital beds at the facility. In addition, large numbers (almost 26%) of emergency nursing staff were out sick with COVID-19 themselves. Staffing challenges led to administrative nurses providing care at the bedside and increased nurse-to-patient ratios from 1:3 to 1:4. Second, the nurse turnover rate for the project site exceeded 30% during the project, reducing the number of nurses available to complete surveys. Finally, charge nurse turnover during project implementation was >46%. Charge nurse turnover created a challenge in providing new charge nurses with information about the resilience bundle, including the use of debriefing and mindfulness activities during shift huddles.

The project included a relatively small sample size of emergency nurses. Larger projects across multiple facilities or multiple departments over a longer period of time would enhance understanding of the effects of resilience bundles.

Moreover, the inability to measure scores for the same individuals across the multiple surveys limited the ability to determine each individual's response to interventions. It is possible that the choice of mindfulness-based activities may have influenced adoption. Finally, the short time frame of the project did not allow for study of potential effects of seasonal variation.

Implications for Emergency Nurses

Since the COVID-19 pandemic, nurse burnout has increased, and some scholars have reported that 30% to 40% of nurses intend to leave the nursing profession.[46,47] Furthermore, emergency departments across the country have experienced a large influx of critically ill patients, ED crowding, and boarding of patients for extended periods of time as a result of COVID-19.[48] Although a resilience bundle is not a substitute for adequate staffing and emotional support for emergency nurses, it can improve the psychological well-being of nurses and help mitigate nurse turnover.[49] Resilience can help build a bridge from burnout to wellness. With positive resilience interventions, burnout may be decreased, and wellness may be enhanced.[28] Nurse leaders should focus efforts to support both individual and organizational resilience, stress reduction, and wellness strategies to enhance nurse well-being as well as retention. Health care leaders also may consider appointing a Chief Wellness Officer, a dedicated person responsible for organizing and overseeing the culture of wellness within an organization.[13]

Conclusion

The implementation of this resilience bundle provided emergency nurses at the project site with new tools to foster and enhance resilience. Results of this project have been shared with leadership hospital-wide. Working to improve nurse resilience is an ongoing effort, and the bundled approach provides a variety of approaches to target resilience for different team members' unique preferences. Future projects would benefit from larger sample sizes from multiple centers, conducted over a longer time frame to increase generalizability of findings.

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Author Disclosures

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Interprofessional In Situ Simulation to Identify Latent Safety Threats for Quality Improvement: A Single-Center Protocol Report

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Abstract

In situ simulation has frequently been used to improve team performance and provide an opportunity for the practice of critical skills and identify latent safety threats, which are undetected risks that may lead to adverse outcomes. However, the use of known quality improvement tools to prioritize and mitigate these safety threats is an area requiring further study. Over the course of 9 in situ simulations of a pediatric shock case, postcase debriefs were held to identify latent safety threats in an emergency department and a mixed pediatric and adult inpatient unit. Latent safety threats identified included structure-related threats such as inability to locate critical equipment, knowledge-based threats relating to rapid intravenous fluid administration, and communication-based threats such as lack of role designation. Identification of latent safety threats in the health care environment may assist clinician leaders in mitigating risk of patient harm. The protocol described may be adopted and applied to other critical event simulations, with structured debriefing used as a tool to identify and mitigate threats before they affect the patient.

Key words: Simulation; Child; Patient harm; Emergency service; Hospital communication; Delivery of health care

Introduction

BACKGROUND AND RATIONALE

The use of in situ simulation to identify and mitigate latent safety threats (LSTs) is an engaging way to identify potential patient and staff safety issues before they occur. Available research has illustrated the capacity for in situ simulation and structured debriefs to assist in the identification of LSTs in the workplace that may have negative impacts on patient outcomes and staff safety.[1] LSTs or "latent errors," as they are referred to in the Institute of Medicine's "To Err is Human" report, are hidden defects that are often easily ignored by health care systems until they snowball or converge, potentially resulting in adverse outcomes.[2] Identifying LSTs can be a product of structured debriefs involving the interprofessional team.[3] In situ simulation has been found to improve clinical skills and teamwork[4] and has the added benefit of taking place in the environment where care occurs. LSTs can be identified using in situ simulation across numerous areas such as protocols, policies, and

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procedures, as well as structural elements including equipment arrangement of the clinical environment.[5] Oftentimes, LST themes emerge over the course of simulations, which can be unique to an institution or common with others.

In situ simulation has been used successfully to detect LSTs in pediatric acute care[6] and has further been used to detect and mitigate equipment-related, technical, and resource/system related threats in cardiac arrest scenarios.[7] Brazil et al[8] discuss the propensity for simulation to improve quality of care through the identification of barriers or enablers of quality. This facility further leveraged simulation for quality improvement (QI) by merging in situ simulation with known QI tools to improve safety surrounding coronavirus disease 2019 (COVID-19) critical airway scenarios.[9]

After structured debriefing to identify LSTs was performed in this protocol, the Survey Analysis for Evaluating Risk (SAFER) Matrix (The Joint Commission) was used to weigh LSTs. The SAFER Matrix, developed by The Joint Commission, provides a visual representation of the scope and likelihood of harm associated with a particular LST.[10] This amalgamation of in situ simulation, structured debriefing, and use of QI tools to longitudinally identify and mitigate LSTs is an area requiring further focus and investigation for its effectiveness in improving patient safety.

OBJECTIVES

This simulation protocol was designed in response to findings in a study performed by the Improving Pediatric Acute Care Through Simulation (ImPACTS) network. The ImPACTS network was formed as a national collaborative of pediatric Academic Medical Centers to improve pediatric readiness in both academic and general emergency departments.[11] The program involves an on-site assessment including the use of in situ simulation and recommendations for QI initiatives.[11] In our site evaluation, the ImPACTS network recommended training focused on pediatric emergencies related to shock, specifically the use of the push-pull method of fluid resuscitation.[11,12]

The primary aim of this program was to identify and weigh LSTs related to pediatric shock through in situ simulation, with the goals of incorporating them into structured QI tools to better understand underlying roots of the problem along with a structured plan for sustained mitigation. The program was planned to improve knowledge of pediatric sepsis and fluid resuscitation among an interprofessional resuscitation team while simultaneously evaluating and mitigating LSTs associated with actual pediatric critical events.

Methods

This study was reviewed and provided an exemption by our facility's institutional review board as a QI initiative (IRB# 2021-13138). The template for intervention description and replication checklist[13] and SPIRIT statement[14] were used in the construction of this protocol to increase readers' ability to replicate the simulation, debriefing, and identification of threats.

STUDY SETTING

This simulation protocol was performed at a 292-bed community hospital in Westchester County, New York. The hospital has the highest ED volume in the county, with pediatric patients representing 10% to 20% of ED volume annually. The hospital contains a mixed adult and pediatric medical-surgical unit but does not have a pediatric intensive care unit; pediatric patients requiring critical care services are instead transferred to nearby tertiary care centers.

Structural elements in place in this facility before intervention include universal basic life support certification for nurses and unlicensed assistive personnel, requirement of advanced cardiac life support for registered nurses, and requirement of pediatric advanced life support certification for nurses in the emergency department and pediatric unit. In addition, daily checks of code carts are completed to ensure availability of necessary life support equipment, and education about code cart contents is performed upon hire and annually. Regarding communication, completion of Team Strategies and Tools to Enhance Performance and Patient Safety training is required for providers, nurses, and unlicensed assistive personnel upon hire. Finally, there is an existing sepsis task force who meet monthly to review compliance with treatment of septic shock standards of care and related events.

INTERVENTIONS

This program leveraged the Plan-Do-Study-Act (PDSA) cycle, developed by Dr W. Edward Demings and Walter Shewhart, and forms the core of the Model for Improvement by the Institute for

Healthcare Improvement.[15,16] This report details the initial cycle and development of such a program, with supplementary content in the Supplementary Appendix for replication. The primary aim for this program was to identify and weigh LSTs, with the goal of incorporating them into existing QI tools to better understand underlying roots of the problem along with a structured plan for mitigation.

In the "Plan" stage, our team provided basic education for medical staff, both in the emergency department and inpatient unit, regarding pediatric shock management along with the push-pull method of intravenous fluid administration; this was performed at the department meetings and "just-in-time" training on the individual units. The goal of this session was to use our traditional educational methods to try to reach as many medical staff as possible regarding pediatric shock identification and treatment, while also training the "push-pull" method that would later be stress-tested through the in situ protocol. Although the ImPACTS program highlighted the need to review the usage of the "push-pull" method for fluid resuscitation, our simulation team felt the need to advance this by testing its use in the actual clinical environment while also evaluating LSTs that are associated with pediatric resuscitation for shock.

In addition, debriefers were trained in a systems-based debriefing program via a 3-hour virtual seminar. The seminar described the aim of the simulation program and strategies for debriefing. Videos of structured debriefs and participation in debriefing practices with real-time feedback were elements of the training program. This training program was 1 element of a larger systems-based debriefing project by Dr Farrukh Jafri who participated in debriefing in situ simulations during the "Do" stage had all completed the debriefing training program.

In the "Do" stage, an in situ simulation was performed to understand LSTs related to pediatric shock and to test the workflows for staff trained through conventional methods on pediatric shock. The Pearls for System Integration, a standardized tool for systems-based debriefing, was used to maximize the identification of LSTs during the pediatric shock simulation.[17] This framework incorporates (1) participant assessment of predetermined objectives, (2) facilitated discussion on systems issues identification, and (3) obtaining information and background through direct feedback.[17] Simulations began with a description phase to reinforce a shared mental model among the participants and facilitator, as well as a statement of purpose for identifying LSTs to improve pediatric resuscitation care. After the simulation, during the analysis phase, the debriefer used the plus/delta model to cover each predetermined opportunity. Finally, in the summary phase, the data elements captured during the debrief were summarized aloud and cross-checked by the team, providing an opportunity to cross-validate participant contributions. The transcripts from the debriefing sessions were organized into 3 categories: (1) shock management knowledge, (2) equipment availability, and (3) communication.

The simulation scenario was that of a 9-month-old infant with urinary tract infection not tolerating oral fluids, later decompensating into septic shock. Effective management of the scenario was determined to include recognition of shock state, need for glucose check, delivery of antipyretic agent, and administration of broad-spectrum antibiotic agents and rapid fluid bolus. Interventions in effective management included several steps including positioning of airway, use of monitoring equipment, administration of fluid bolus using push-pull or pressure bag method, and administration of medications. The simulations were not video recorded and instead leveraged cross-validation through the Pearls for System Integration framework for an accurate assessment of topics discussed during the debrief.

Participants in the scenario included a clinical team leader (physician, nurse practitioner, or physician assistant), registered nurses, respiratory therapists, and unlicensed assistive personnel. The mixture of staff included in simulation mirrored the interprofessional team who would be present during a critical event in our health care facility. The Supplementary Appendix includes the full pediatric simulation case progression.

DATA COLLECTION

In the "Study" stage of the PDSA cycle, the qualitative data from the debriefs were reviewed by a QI group made up of physician leaders, QI registered nurses, and advanced practice providers to identify LSTs. After each simulation, the data were submitted in an online portal, organized into the following: (1) was Push-Pull performed? (2) delta for knowledge-based LSTs covering management of pediatric shock, (3) delta for equipment-based LSTs, (4) delta for communication-based LSTs. LST data were subsequently placed into subcategories for organization and tracking.

These subcategories then were assigned a value in the SAFER Matrix through assignment as being of low, moderate, or high risk of harm to the patient. The debriefer had already organized the qualitative data belonging to the predetermined categories of interest, and therefore, the SAFER Matrix also was organized as such. Ratings for likelihood of harm were determined by the QI group: senior staff in the observed departments who filled out an anonymous

online survey rating each LST as low risk, medium risk, or high risk. Finally, the number of times each safety threat occurred was recorded to determine the scope of the threat or likelihood that the same event would occur in future events. For example, the inability to locate the pediatric crash cart was categorized as an equipment-related safety threat with a high likelihood of harm and a high scope. The goal of such weighted assignment based on impact of harm was to triage the threats to help organize the respective QI teams on where to focus their energy at onset.

Originally, the team planned to hold several PDSA cycles with the goal of reducing the identified safety threats and evaluating the impact of remediating interventions (the Act phase of PDSA). However, owing to competing priorities as the second wave of the COVID-19 pandemic impacted the region, only the first cycle of simulations was held. Instead, the safety threats identified were discussed with the leadership team of both units for abatement with the primary drivers incorporated (see Supplementary Appendix for driver diagram). After this, a similar protocol for identification of LSTs focused on the adult population was implemented in the emergency department for COVID-19 management.[18]

OUTCOMES

A total of 9 in situ simulations were run between July and September 2020, 4 of which were held in the emergency department and 5 on a mixed pediatric and adult medical-surgical unit. Upon review of the 9 completed simulations, several LSTs were identified as opportunities to improve practice surrounding pediatric shock.

A total of 25 LSTs were identified during simulations, with 14 occurring in the mixed pediatric and medical-surgical and 11 in the emergency department. These are noted in Figures 1 and 2. Most frequently observed were LSTs related to equipment; these were often rated highly likely to cause harm to the patient. Notable equipment-based LSTs included difficulty in locating intravenous infusion pumps ($n = 2$), pressure bags ($n = 3$), intraosseous needles and related equipment ($n = 5$), and crash carts ($n = 4$). Knowledge-based LSTs were related to a lack of knowledge surrounding rapid fluid resuscitation ($n = 5$) and push-pull technique ($n = 2$). Finally, communication-based LSTs included trouble with clear role designation ($n = 1$), closed loop communication ($n = 3$), and hand-off communication ($n = 1$).

Cause and effect and driver diagrams were subsequently developed to address the LSTs identified during the simulations. Primary drivers for the pediatric unit included (1) lack of knowledge on push-pull and (2) needing prompting to use push-pull. For the "Act," the following change concepts were incorporated: (1) repeat push-pull training for all inpatient units' staff, (2) crash-cart training for location of equipment, (3) reviewing signs of pediatric shock at training sessions, and (4) building in an order set for push-pull into the fluids administration for pediatric shock.

For the emergency department, primary drivers included (1) difficulty to locate items and (2) difficulty to read labels for equipment. Change concepts put into place included (1) designated location for pediatric shock items (push-pull), (2) clear floor signage through decals for pediatric resuscitation equipment and crash carts, (3) a trimmed cart checklist for ease of access for equipment, (4) restocking system put into place for expired items, (5) simplified equipment stocking and design, and (6) improved signage in the pediatric carts.

As previously mentioned, re-evaluation via a new PDSA cycle was not performed owing to competing priorities.

Discussion

In this QI-based in situ program, we demonstrated a technique that can be used to identify, weigh, and track LSTs over time for a QI initiative. Although they were designed for pediatric shock, we immediately found LSTs that went beyond shock into broader areas of opportunity, including ease of access of the pediatric crash carts along with reorganization of supply closets and improvements in communication for team-based resuscitation.

A strength of this protocol was that it was implemented across 2 different settings—the emergency department and the pediatric inpatient unit—as a means of identifying different LSTs in different arenas that could have been related to level of care, structural differences, team dynamics, etc. Although this program was cut short secondary to the pandemic, the same technique was leveraged to assist in managing the initial stages of the COVID-19 pandemic in the emergency department[18] and has since been used for cardiac arrest in the cardiac catheterization laboratory, pediatric seizure management in the emergency department and inpatient units, and a behavioral health simulation. This technique has expanded into 5 different hospitals in a short period of time through the Merging In Situ Simulation and Quality collaborative; publication of this multisite initiative is in development. Owing to competing needs in pediatrics at our facility, a decision was made to focus the in situ simulation/QI program from pediatric shock to pediatric seizure, a program that is ongoing and currently in its third PDSA cycle.

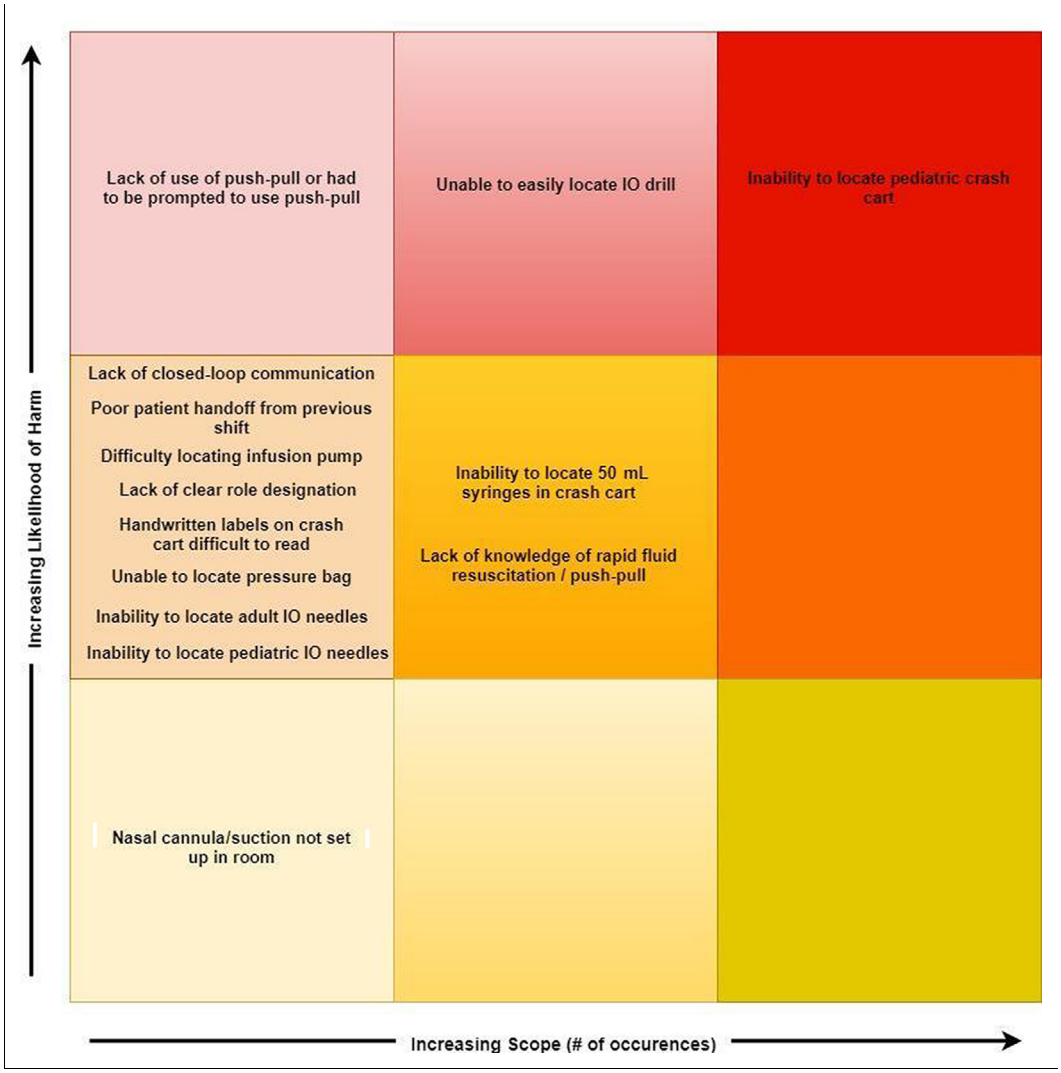

FIGURE 1

Latent safety threats: mixed pediatric/medical-surgical. Those LSTs that occurred only one time are organized into the left column of the chart. The center column includes LSTs that occurred more than one time but less than 3 times during simulations, and those that occurred more than 3 times are in the right column. The *y* axis was determined by identifying the category of threat and labeling its likelihood of harm to the patient or staff by the quality team through group consensus; the bottom row demonstrates least likelihood of harm whereas the top contains threats with the most likelihood of harm. IO, intraosseous.

The quality findings were important for mitigation of risk through nursing education and structural changes to make equipment more visible and accessible. Our protocol demonstrates that threats can be weighed and prioritized upon recognition and used in cause and effect and driver diagrams to identify opportunities for mitigation of risks (see Supplementary Appendix).

For example, upon recognition of LSTs identified in this study, in-services were held to educate about the push-pull method and footprint signage was implemented on each unit to mark the location of the pediatric code cart. Upon identifying LSTs, prompt initiation of targeted education was instrumental in improving care delivery at every link in the resuscitation chain. Placing a value of

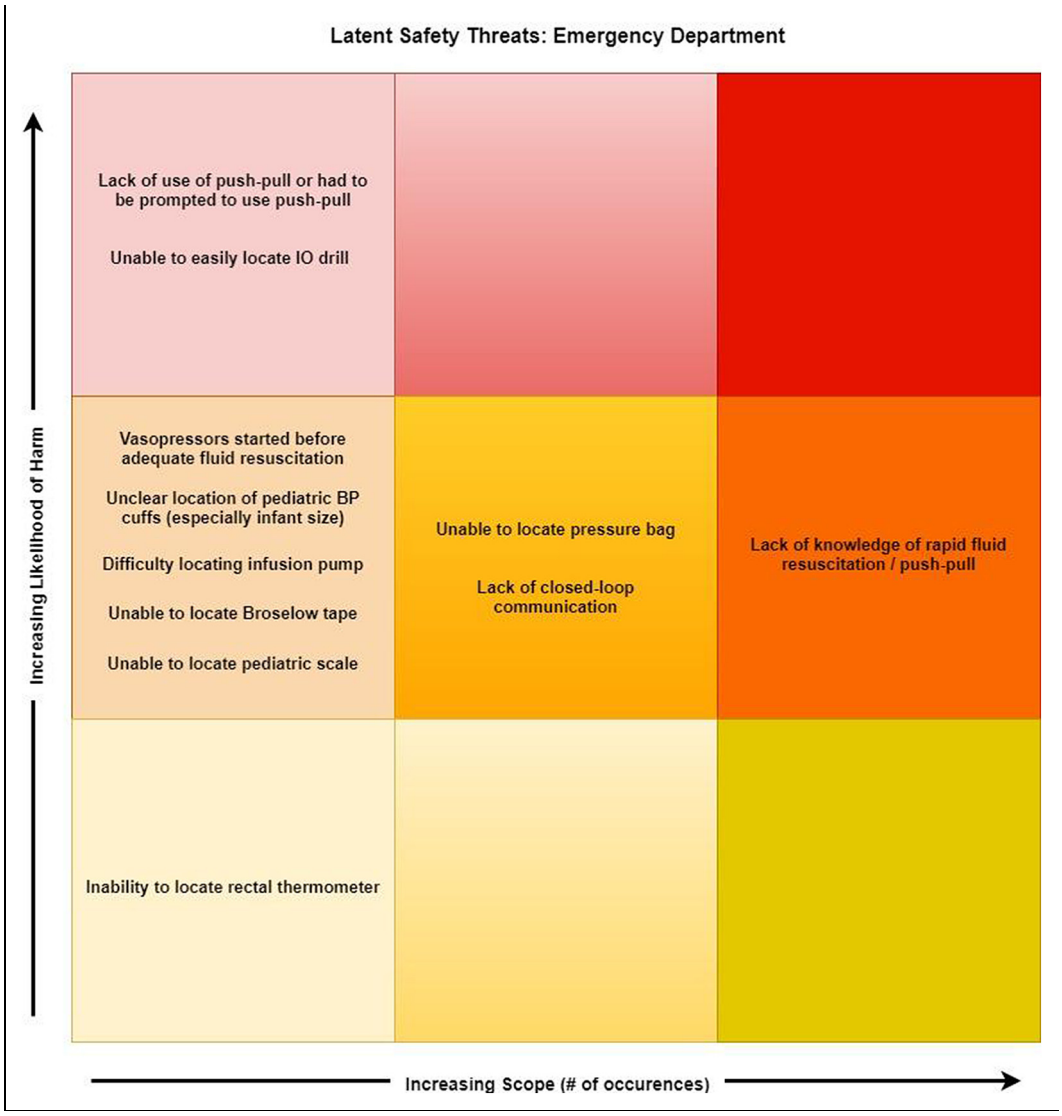

FIGURE 2

Latent safety threats: Emergency Department. Those LSTs that occurred only one time are organized into the left column of the chart. The center column includes LSTs that occurred more than one time but less than 3 times during simulations, and those that occurred more than 3 times are in the right column. The *y* axis was determined by identifying the category of threat and labeling its likelihood of harm to the patient or staff by the quality team through group consensus; the bottom row demonstrates least likelihood of harm whereas the top contains threats with the most likelihood of harm. BP, blood pressure; IO, intraosseous.

likelihood to cause harm to the patient, educators could focus their efforts appropriately on the highest-risk LSTs and gain perspective regarding where the units were lacking.

A limitation of this study was that only one phase was completed. There was a desire to complete more phases as a means of comparison, but the advent of the COVID-19

virus took precedence and our facility's inpatient pediatric unit was closed at that time. However, as discussed, this program allowed a blueprint to allow for further in situ simulation-based QI programs to develop rapidly, including expansion to other hospital sites.

We uncovered numerous LSTs after staff received initial training in the push-pull method of pediatric fluid administration. LSTs were detected in the areas of both structure and process. This research may serve as a template on how to build an in situ simulation program and debrief scenarios to identify LSTs in a variety of settings, among any patient population.

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Supplementary Data

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A Problem Well-Named is a Problem Half-Solved: Usefulness of Nursing Diagnosis as a Way to Teach Emergency Nursing

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Key words: Nursing education; Emergency nursing; Nursing diagnosis; Nursing assessment

Patients presenting to the emergency department are generally unknown and potentially acutely ill; there is not the same understanding of the patient problem as in inpatient nursing, where the patient has been evaluated and assigned a medical diagnosis. Teaching nurses new to the emergency department how to quickly identify life-threatening problems is challenging, as it requires a mental shift from the diagnosis-based care of inpatient nursing to a symptomatic presentation orientation. In this article, I will present the case for nursing diagnosis as a way to orient nurses new to the emergency department in thinking about patient problems and immediate interventions.

Many nurses educated in the United States are exposed to some degree to a nursing language. Nursing language is used specifically to determine problem and etiology so that the best nursing interventions can be derived to address the patient's problem and assist the patient in moving from presentation to outcome. There is a critical link between problem identification and problem solving and, therefore, effective patient care. Van Horn and Kautz[1] recognized that the use of nursing languages such as North American Nursing Diagnosis Association, Nursing Interventions Classification, and Nursing Outcomes Classification in evidence-based practice promoted the retention of essential nursing practice rather than an immediate jump to the medical model for evidence-based practice.[2]

Although Hoyt and Cajon[3] recommended the use of standard nursing language for emergency nursing, the environment of the emergency department is often offered as a reason why it is not used in nursing care or documentation, specifically the patient load, lack of a standardized model for use of nursing diagnoses, and lack of administrative support for their use, as well as a decided lack of theoretical or practical training in the use of nursing diagnosis.[4] Castner[5] suggested that nursing diagnosis is not as useful owing to the generally collaborative nature of emergency nursing and that nursing diagnoses be used in the pattern of "nursing care needed: system: clarifier" where the clarifier is left to nursing judgment. In emergency practice, this is arguably a valid suggestion; however, it obscures the contribution of nursing knowledge to the understanding of patient problems, which is critical at the initial encounter.

Why then should we consider the use of nursing diagnoses to frame assessment and care in the initial education and training of nurses new to the emergency department? The language of nursing diagnosis can be viewed not as a label or a checkbox but as a clinical judgment[6] and thus helps to describe what nurses do. Nursing diagnoses provide a perspective for naming, understanding, and thinking about a set of clinical observations; naming a problem as it may present in the emergency department requires both a considerable knowledge base and the recognition and clustering of specific cues and their meaning when they appear separately or together.

This becomes important in the uncertain clinical environment of the emergency department, where patients may be under nursing care for some time before a medical diagnosis is determined. The use of nursing diagnoses allows emergency nurses to identify the effect of the problem on the patient and begin to treat the effects. Use of nursing

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diagnoses are reported in general emergency nursing,[7] trauma care,[8] and prehospital care.[9,10]

Usefulness of Nursing Diagnosis in Emergency Nursing

Common nursing diagnoses used in emergency departments include impaired gas exchange, ineffective breathing pattern, impaired spontaneous ventilation, risk for infection, risk for impaired skin integrity, impaired tissue integrity, risk for falls,[11] and decreased cardiac tissue perfusion.[12] Other commonly seen problems are knowledge deficit, anxiety, and alterations in comfort. These are not just labels chosen off a list but the codification of a nursing judgment made after an assessment.

How Do We Structure Education Around This Idea, Then?

For nurses new to the emergency department, seeing the effect a problem has on the patient and then gathering information to confirm the cause is critical. For example, a 78-year-old patient with a history of chronic obstructive pulmonary disease comes into the emergency department complaining of shortness of breath. The patient's oxygen saturation (SaO_2) is 90%; respiratory rate (RR) is 24 and shallow. Lungs are clear. The patient has recently recovered from a severe case of shingles and has some postherpetic neuralgia that is still causing severe pain. It is reasonable to identify the problem as an ineffective gas exchange, as evidenced by his low SaO_2 and his RR of 24, or as an ineffective breathing pattern, as evidenced by his shallow breathing. We also should consider an alteration in comfort as a priority nursing diagnosis.

If we start with a medical diagnosis (chronic obstructive pulmonary disease), we might anticipate orders for steroids, bronchodilators, and oxygen. If we start with a nursing diagnosis (pain/alteration in comfort, ineffective breathing pattern, ineffective gas exchange) related to his postherpetic neuralgia and evidenced by his shallow breathing and stated pain, we also can address the underlying cause of the patient's poor oxygenation. The pain gets addressed, and we expect that the gas exchange issue also will be resolved. How will we know? Breathing becomes less shallow, RR comes down, and SaO_2 comes up.

Similarly, if we consider a patient with vomiting and diarrhea as a problem of fluid and electrolyte imbalance rather than gastroenteritis, the interventions are clear regardless of medical diagnosis: replace fluids and electrolytes. The outcomes are equally clear: measures of adequate fluid and electrolyte balance. In severe cases, this also may be a problem of inadequate tissue perfusion, which elevates the patient's risk profile, and is not intuitive to a medical diagnosis of gastroenteritis.

Preventing Premature Closure, Anchoring, and Diagnostic Momentum

Finally, the use of nursing diagnoses can mitigate problems of premature closure, anchoring, and diagnostic momentum, which can result from an immediate attachment to a medical diagnosis. This is an important consideration, because the continuous assessment and treatment of patient problems as described by nursing diagnosis allows for a more open-ended focus on the underlying pathophysiology. In addition, it can keep nurses focused on managing ongoing risks; if we use our gastroenteritis versus fluid and electrolyte imbalance example, the nurse will focus on risks such as alterations in fluid and electrolyte balance and ineffective tissue perfusion as well as checking in on the patient for pain or vomiting.

Emergency nursing education benefits from a focus on nursing diagnosis to give nurses new to the emergency department specifically a grounding in how medical problems affect humans, the resultant risks of those effects, and how to manage and evaluate interventions.

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Emergency Nursing Review Questions: January 2023

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These review questions are based on the Emergency Nursing Core Curriculum and other pertinent resources to emergency nursing practice. They offer emergency nurses an opportunity to test their knowledge about their practice.

QUESTIONS

1) A 3-week-old infant presents to the emergency department with altered mental status. The father states that he witnessed the baby "roll off of the bed" onto a hardwood floor. What should you be most suspicious of regarding the history?
   a. Baby was left unattended.
   b. Baby rolled off of the bed.
   c. The floor was hardwood.
   d. Baby was in the middle of the bed.

2) Child protective services presents to the emergency department with a 16-month-old child that was removed from his home. His injuries include bruises on torso, ears, and nose in multiple stages of healing and burns to the lower half of his body. His mother admitted that she held the child in hot water after he would not stop whining. What pattern of burns would you expect to see on the child?
   a. burns to lower body, sparing the buttocks, clearly demarcated burn lines
   b. irregular burn lines with burns on anterior legs and lower torso
   c. irregular burns to top of feet
   d. burns to anterior chest with a "splash" appearance

3) What studies are not part of a routine workup of a patient with suspected nonaccidental trauma?
   a. skeletal survey
   b. complete blood count
   c. thyroid studies
   d. liver function test

4) What fractures have been found to be highly specific for nonaccidental trauma?
   a. femur fracture in a 7-year-old ambulatory child
   b. classic metaphyseal lesion in a 1-year-old
   c. humerus fracture in a 6-year-old
   d. tibia/fibula fracture in a 10-year-old

5) Accurate and thorough documentation is often the key to holding abusers responsible. Which example of documentation is correct?
   a. Mom's boyfriend acted guilty so he must have caused their injuries.
   b. The patient had a hand print the size of mom's hand on her leg.
   c. George Smith, mother's boyfriend, stated baby "fell off of the changing table onto the floor."
   d. Father states that baby fell onto a carpeted floor and had no loss of consciousness.

ANSWERS

1. Answer: B

When taking a history of a pediatric patient, it is important to consider developmental milestones in relationship to their injury. In this particular case, it is extremely unlikely that a 3-week-old baby would be able to roll from the middle of the bed and off of the bed independently. Rolling from back to belly is a milestone that is most commonly achieved at 4 to 6 months of age. Nonaccidental trauma

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should be considered in all patients whose age and mechanism of injury do not match.[1]

2. Answer: A

Burns to the perineum and lower legs are very commonly associated with intentional burns. Often the buttocks, or a portion of the buttocks, are spared because they are pressed against the bottom of the tub/sink/container, where it is cooler, as they are being held in the water. The burn line in intentional burns is often clearly demarcated because of being held into the water with few splash marks owing to the child flailing. In an accidental burn, the burn marks are generally irregular and often do not cover both anterior and posterior surfaces.[1-3]

3. Answer C:

Thyroid studies are not indicated in a routine workup for nonaccidental trauma. Skeletal survey in kids at the age younger than 2 years or nonverbal children will help to identify all current, old, and healing fractures. Complete blood count is important to look for any major bleeding. Liver function test will help to identify occult abdominal injuries and need for further abdominal imaging.[1,3-5]

4. Answer: B

Classic metaphyseal lesions (ie, bucket-handle fractures) are highly specific for nonaccidental trauma. The other fractures are possible nonaccidental fractures but not highly specific.[1,3,5]

5. Answer: C

Many abusers are caught by major changes in their stories. It is important to document exactly what is said and by whom. If everyone documents exactly what is said, it is easier for law enforcement or child protective services to see all of the changes in the story. It is never acceptable to put judgments in patient health records. It is best to only record facts, and measurements of bruises, contusions, etc.[1]

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The Effect of Virtual Reality and Buzzy on First Insertion Success, Procedure-Related Fear, Anxiety, and Pain in Children during Intravenous Insertion in the Pediatric Emergency Unit: A Randomized Controlled Trial

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Contribution to Emergency Nursing Practice

- The first-attempt intravenous success rates, procedure-related pain, and anxiety scores were similar between the groups.
- This study contributes that virtual reality or Buzzy distractions may be effective in reducing procedure-related fear in children during intravenous insertion.
- Use of distraction methods may be useful for reducing pain and fear among pediatric patients during intravenous insertion in the pediatric emergency department.

Abstract

Introduction: Distraction methods such as virtual reality and cold vibration device are recommended during intravenous interventions. Few studies have focused on the impact of nonpharmacological interventions on intravenous insertion success.

Methods: A randomized controlled study evaluated effect of virtual reality and cold vibration device application on first-attempt intravenous insertion success and procedure-related pain, fear, and anxiety during intravenous insertion in children. Children aged 4 to 10 years (N = 150) undergoing peripheral intravenous catheterization insertion in the pediatric emergency department were randomized to 1 of 3 groups: virtual reality, cold vibration (Buzzy), and control group. Distraction technique of talking and asking questions of children was used in control group. Primary outcome was first-attempt intravenous insertion success; secondary outcomes were procedure-related pain, fear, and anxiety. Study data were collected using Difficult Intravenous Access score, Emotional Appearance Scale for Children, Wong-Baker Faces Pain Rating Scale, Color Analog Scale, Children's Anxiety Meter-State, and Child Fear Scale. Data were analyzed using chi-square test, Fisher exact test, and Kruskal–Wallis test.

Results: There were no significant differences in first-attempt intravenous insertion success rates (virtual reality = 47.2%, Buzzy® = 50%, control = 46.9%), preprocedural emotional appearance scores, and procedure-related pain and anxiety scores. There was no difference between groups for vital signs before, during, and at fifth minute of procedure.

Discussion: Virtual reality and Buzzy may decrease procedure-related fear in children during intravenous insertion. This research has shown that pediatric emergency nurses can reduce pain and anxiety by talking to children, and simple distractions such as asking questions are as effective as more technological ones.

Key words: Virtual reality; Cold vibration/Buzzy; Child; Peripheral intravenous catheterization; First-attempt IV insertion success; Pain

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Introduction

Many of the nonpharmacological methods comprise cognitive-behavioral approaches and help distract children's attention from fearful and painful procedures. Cognitive interventions are used in children to direct attention away from procedure-related pain. These approaches promote the right of the child to be fully involved in the procedure. Distraction is the most frequent intervention used in the emergency department to guide children's attention away from the painful stimuli.[1] The nonpharmacological methods applied in the pediatric emergency department (PED) aim to reduce fear and pain and keep the child active during the intervention.[2,3] These distraction methods, which are used in invasive procedures, can be listed as using distraction cards, watching cartoons, making foam bubbles, listening to music, looking through a kaleidoscope, and using virtual reality (VR) glasses.[4,5] These methods do not eliminate the pain but raise the pain threshold by increasing the child's tolerance to pain.[5] Nonpharmacological methods are recognized as reliable and inexpensive and are independent practices of the nurse.[5,6]

The combined or comparative use of pharmacological and nonpharmacological methods in studies conducted in the PED are limited.[7-9] The effect of these distraction methods on pain and fear as well as on intravenous (IV) insertion success should be evaluated. While applying painful interventions, nurses also can apply different methods, such as touching, talking to distract attention, or asking questions. These distraction methods are particularly important for children to have a positive hospital experience. The cold vibration device (Buzzy; Pain Care Labs, Altanta, GA), a bee-shaped gadget producing vibrations and cooling through freezable wings, is effective in reducing pain and frequently used in IV insertion, phlebotomy, and vaccination interventions. A mechanical effect is created by applying the bee-shaped gadget a few centimeters from the needle entry point. It has a cryotherapy effect from a removable cold liquid device.[3,9-11] It was developed as a pain-blocker device for pain management in children.[8] In the study by Baxter et al,[12] children who received cold vibration and standard care experienced less pain. The topical lidocaine and nonpharmacological methods are more effective when combined or used together.[5] Many studies have been conducted on the effect of Buzzy on reducing pain in phlebotomy or vaccine administration. In another study, children received interventions such as Buzzy, jet lidocaine, bubble-blowing, or aromatherapy for pain, stress, and fear associated with phlebotomy. There was a significant difference between intervention and control (no distraction) group's fear levels in favor of the Buzzy group.[3] Kearl et al[8] showed benefit of combined use of Buzzy with the use of J-tip lidocaine injection (National Medical Products, Inc, Irvine, CA).

Children receiving either intervention (J-tip or Buzzy+J-tip) reported lower pain scores during venipuncture or IV start than the no analgesia group.[8] Canbulat Şahiner et al[10] found that the Buzzy group showed significantly lower pain and anxiety levels than the control group (no intervention) during immunization. Binay et al[11] found that Buzzy and blowing soap bubbles had a pain-relieving effect in children during phlebotomy. Bourdier et al[7] compared Buzzy and standard care (EMLA/lidocaine 2.5% and prilocaine 2.5% patch) on pain during cannulation in PED. The Buzzy was not as effective as the standard care method in children 18 months to 6 years old.[7]

Digital distraction also provides pain and distress reduction for children.[13] The VR distraction can be used to relieve pain during IV insertion and phlebotomy in children.[14-17] Dumoulin et al[14] found a significant reduction in fear of pain and pain intensity in VR, watching television, and distraction provided by the Child Life program group in children aged 8 to 17 years. They found that VR showed the best improvement in reduction in fear of pain in PED.[14] In the systematic review of McCahill et al,[18] the use of VR was found effective in anxiety reduction in children aged 4 to 7 years. Caruso et al[19] concluded that VR reduced anxiety and fear in patients aged 6 to 18 years and was safe to use.

The effects of these VR and Buzzy distraction methods on the IV insertion success should investigate pain or anxiety as well. Studies evaluating the effect of IV insertion success in the younger age group are very limited.[3,5,7-11] The use of nonpharmacological methods may increase IV insertion success in children. In the study of Schlechter et al,[20] they found that first-attempt IV success rates were high and were similar between the groups (VR = 81.0%, standard = 84.2%). Baxter et al[12] found that success on the first IV attempt was 3 times more likely in the Buzzy group than in the standard care group. VR and Buzzy appear to be safe and well tolerated in children and also may affect the first-attempt IV success.[12,20] Many studies generally focus on pain and fear, and few have focused on IV insertion success. Children's previous experiences and negative emotions also can be determined before the procedure. Nonpharmacological methods can be planned according to the emotional state of the child.[21,22]

This study aimed to evaluate the effect of VR and cold vibration device distraction on the first-attempt IV insertion success, procedure-related pain, fear, and anxiety during IV insertion in children aged 4 to 10 years in the PED.

H1: First-attempt IV insertion success is higher in patients who use immersive experiments with VR glasses or apply the cold vibration device (Buzzy) during the procedure than in the control group.
H2: The pain, fear, and anxiety scores of the patients who use immersive experiments with VR glasses or apply the cold vibration device (Buzzy) during the procedure are lower than those of patients in the control group.

Methods

This prospective, randomized controlled study was conducted at a PED in Izmir, Turkey, between December 2020 and January 2021. A parallel trial design was used describing VR (Samsung Gear Oculus headset), cold vibration device application (Buzzy mini personal), and control group as the third arm. This study was guided by the Consolidated Standards of Reporting Trials (CONSORT) checklist.[23]

STUDY SAMPLE

Children who underwent IV insertion were eligible to participate in the PED in a province of the Aegean region in Turkey. The inclusion criteria were being between the ages of 4 and 10 years and being conscious (with the ability to communicate). The exclusion criteria were having a physical and psychological condition that prevents them from wearing glasses to view VR; having a visual problem; having mental or physical disabilities; taking any analgesic, sedative, or anticonvulsant; having chronic or life-threatening disease; and refusing the VR or Buzzy intervention during IV insertion.

The sample size was determined with a power analysis, using an effect size of 30% at 95% confidence interval and a type 1 error probability of 5% for the *F* test analysis. In the G*Power version 3.1.9.7 statistical program, based on the results of first-attempt IV success rates by Schlechter et al,[20] the total sample size was calculated as 148 children. In the comparison of pain and anxiety scores in the study by Canbulat et al,[24] the minimum sample size was calculated as 34 children for each group. In the study, it was planned to fulfill the parametric test assumptions and to have 50 children for each group and 150 children for the total sample, considering 10% loss.

ENROLLMENT AND ALLOCATION

A trained researcher PED nurse enrolled the participants who met the eligibility criteria and obtained consent from parents. This researcher PED nurse was employed at the place where the study was conducted, with 5 years of experience and a master's degree. The enrollment was the consecutive arrivals in the department. The patients were randomly and equally assigned into 3 groups: VR (immersive experiment), cold vibration device application (Buzzy), and control group (attention distracted by asking questions). The researcher PED nurse allocated the patients by the stratified randomization: age (<7 or ≥7 years) and have or do not have difficult IV access (DIVA) (according to the difficult vascular access score/ ≥4 or <4 points). The researcher PED nurse randomly divided the participants into groups (at a ratio of 1:1) and assigned 3 combinations (1-3) per group using a random number generator. The allocation concealment was guaranteed by a computer-generated number table. A total of 163 children were assessed for eligibility, and 13 children were excluded: 3 refused to participate; 9 had chronic or genetic diseases; and 1 had a visual problem. The final sample comprised 150 children (Figure).

OUTCOMES

The likelihood of DIVA was determined by using the DIVA score[25,26] during the assignment of the children to the groups before the procedure. The emotional appearances of children were evaluated using the Emotional Appearance Scale for Children[22,27] before the procedure. The primary outcome was first-attempt IV insertion success. Secondary outcomes were procedure-related pain, fear, and anxiety. Procedure-related pain was measured using the Wong-Baker Faces (WBS) Pain Rating Scale[28] and Color Analog Scale.[29] The procedure-related fear and anxiety was measured using The Child Fear Scale (CFS)[30,31] and The Children's Anxiety Meter.[31,32] In addition, vital signs also were measured before, during, and 5 minutes after IV insertion. The vital signs were recorded on the procedure follow-up form.

Procedure Follow-up Form

The child's DIVA score, procedure initiation time, vital signs, and first-attempt IV insertion success were recorded. First-attempt IV insertion success was defined as the fact that IV placement was made by the nurse in the first attempt.

Difficult Intravenous Access Score

It was developed by Yen et al.[25] The DIVA score with 4 parameters (visibility, palpability, age, and prematurity history) was found to be valid and reliable for Turkish children.[26] The vascular access is assessed as difficult with a 50% failure rate if the total score is 4 and above.[25]

Emotional Appearance Scale for Children

This scale allowed direct behavioral observation and consisted of 5 different behavioral categories: "Facial Expression," "Speaking," "Activity," "Interaction" and "Cooperation Level." The total score is 5 to 25 points calculated by adding the points obtained for each category. Higher scores indicated the appearance of more negative emotional behaviors.[22,27]

WBS Pain Rating Scale

This scale is used in children aged 3 and older to rate pain severity (0-10). The child was asked to choose the face expressing their pain.[28]

Color Analog Scale

This scale is a commonly used self-report measure of pain. It is a 2-sided plastic instrument that consists of a wedge-shaped color-gradated figure (white bottom end to dark red top end) on one side, a numerical scale on the other, and a moveable slider. The child was asked to rate their pain by moving the slider and the corresponding numerical score was recorded.[29]

The Child Fear Scale

This 1-item scale measures procedure-related fear in children and consists of 5 sex-neutral faces, which correspond to no fear (0), a little fear (1), some fear (2), much fear (3), and extreme fear (4).[30,31]

The Children's Anxiety Meter

This assesses children's anxiety and is used before medical procedures. This scale is drawn like a thermometer with a bulb at the bottom and includes horizontal lines at intervals going up to the top (0-10). Higher values represent higher anxiety.[31,32]

DATA COLLECTION

The standard approach was applied to all pediatric patients by the researcher PED nurse. The standard approach included providing information about the procedure, introducing herself, choosing the area together, and being with the parent during the procedure. The children in the control group were asked distracting questions during the IV insertion. Children in the VR or Buzzy group were not spoken to during the VR or Buzzy intervention to avoid confounding the effectiveness of these devices. Responses were only given when the children asked questions such as whether it was over or not. After each child was included in the study, we took the child to the chair where the IV insertion was performed (the starting hour/minute of the procedure was recorded). The child's systolic and diastolic blood pressure, pulse, and respiratory rate were monitored (time 0).

The child's emotional appearance was evaluated with the Emotional Appearance Scale for Children by a trained PED nurse before the procedure. This nurse had 10 years of experience in PED. She received training on the application of scales, and practice was made by applying scales to different children who were not in the study. Children did not know which intervention or control group they were in before their emotional appearance was rated. The IV insertion was performed by the researcher PED nurse (Time 1). Pain, fear, and anxiety scales were administered to the children by the trained PED nurse without the nurse's knowing which group the children belonged to. The scales were marked by the children at the fifth minute after the procedure was finished.

The child was expected to calm down after the procedure. The scales were administered to the child by a trained PED nurse who did not know in which group the child was; thus, blindness was achieved. This nurse, who applied the scales to the child, was not with the child during the intervention. Therefore, pain, fear, and anxiety were evaluated at the fifth minute after the insertion. Because the scales were applied after the procedure, the trained PED nurse did not know which group the children were in. During the 5-minute period after the procedure was over, the nurse tried to distract the child by talking or asking

questions. A standard approach was applied to all groups with statements such as "I'm applying the tape, thanks for your cooperation" in this 5-minute period. Pulse and respiration were re-evaluated at the fifth minute after the procedure finished (Time 2). At the fifth minute after the procedure finished, the child was asked to evaluate the most painful moment during the procedure with a WBS Pain Rating Scale and Color Analog Scale. The CFS and The Children's Anxiety Meter were used by the child to indicate how anxious and afraid they were during the procedure. The child was asked to mark it with a pencil by a trained PED nurse.

Control Group

No distraction device was used in the control group. Attention was distracted by asking questions such as "How old are you? Which grade are you in? What is the name of your favorite friend? Which sport do you like better?"

VR Group

The nurse researcher introduced a virtual headset to the child and said that he/she could use immersive experience by wearing a virtual headset during the procedure. The participants underwent the experiment by using Oculus Rift VR and Samsung Galaxy S7 mobile phone. It had the headset display to provide immersive VR. The 3 virtual environments (ie, roller coaster, mine craft, ocean rift) selected in this study by the researchers were suitable for children. The children selected the virtual environment and wore the headset. The immersive experiment began when the IV insertion area was determined and ended 5 minutes after IV insertion. If the child desired to remove the virtual headset during the insertion, he/she was excluded from the study.

Cold Vibration Device (Buzzy) Group

The bee Buzzy was attached to the arm where the nurse researcher performed the IV insertion. Gate control theory may offer an explanation for the effect of Buzzy.[11] The IV insertion area was determined by the nurse researcher. Buzzy was tied 5 cm above the IV insertion area, and after waiting 15 seconds, IV insertion was performed by the nurse researcher, and Buzzy was ended 5 minutes after IV insertion was completed. If the child requested removal of VR or Buzzy during IV insertion, the child was excluded from the study. Buzzy and VR were cleaned with disinfectant before and after each intervention.

ETHICS

Ethical approval was received from an institutional review board (5891-GOA). The nurse researcher informed the children and their parents about the study. If the child and parents agreed to participate, we obtained written consent forms. This study is registered with ClinicalTrials.gov: NCT04853056.

ANALYSIS

Percentages and means were used to evaluate the sample demographics. The data were analyzed using SPSS for Windows version 23.0 (IBM, Armonk, NY). The normal distribution of the data was assessed by Kolmogorov–Smirnov and Shapiro–Wilk tests. Chi-square test and Fisher exact test were used to examine the demographic differences in groups. If the scores were not normally distributed, Kruskal–Wallis test was used for nonparametric analysis. The emotional appearance, pain, fear, and anxiety scores of groups were not normally distributed; the comparisons of the scores of the 3 groups were evaluated with Kruskal–Wallis analysis. Vital signs of the patients before, during, and at the fifth minute of IV insertion and procedure time were evaluated with analysis of variance (ANOVA) test. $P < .05$ was accepted as statistically significant.

Results

DEMOGRAPHICS

The final sample consisted of 150 children. No child refused the VR or Buzzy distraction during the IV insertion (Figure). There were no statistically significant differences in demographic characteristics ($P > .05$) (Table 1).

DIVA SCORES, FIRST-ATTEMPT IV INSERTION SUCCESS, AND VITAL SIGNS OF GROUPS

The mean DIVA scores ranged from 2.0 to 2.3 in all groups. DIVA scores were ≥4 points in 39.2% of the VR group, 42% of the Buzzy group, and 46.9% of the control group (≥4 points = difficult IV access). There were no differences in terms of DIVA scores. The first-attempt IV insertion success rates were similar among the groups (VR = 47.2%, Buzzy = 50%, control = 46.9%). There were no differences

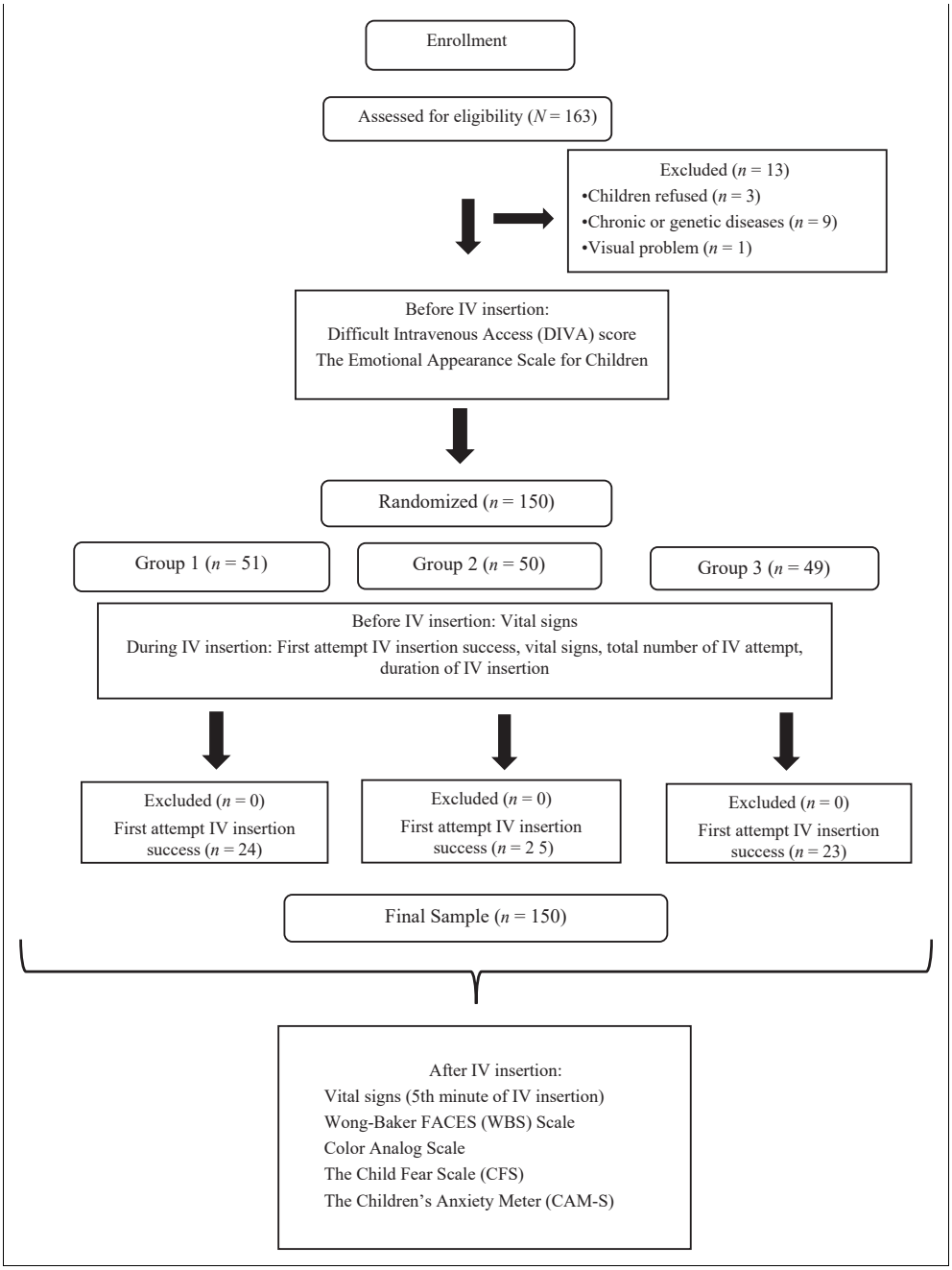

FIGURE 1
Consolidated Standards of Reporting Trials flow diagram.

in the first-attempt IV success rates according to the DIVA scores (<4 or ≥4 points) (Table 2).

There were no statistically significant differences in terms of having DIVA, skin condition, peripheral intravenous catheterization area, catheter size, first-attempt IV insertion success, the number of IV insertions, pulse, respiratory rate, and blood pressure before (time 0), during (time 1), and after (time 2) the procedure or duration of

TABLE 1
Demographics of children

	VR group			Buzzy group			Control group			Test	*P* value
Demographics	**Mean**	**SD**	**Min-Max**	**Mean**	**SD**	**Min-Max**	**Mean**	**SD**	**Min-Max**		
Age (y)	6.4	1.6	4-9	6.7	1.7	4-10	6.4	1.6	4-9	0.533*	.588
Gender	*n*	%		*n*	%		*n*	%			
Female	24	47.1		23	46.0		24	49.0		1.134†	.567
Male	27	52.9		27	54.0		25	51.0			

VR, virtual reality.
* ANOVA
† Chi-square test

IV insertion ($P > .05$). The IV insertion duration was 10.5 minutes in VR group, 11.3 minutes in Buzzy group, and 9.9 minutes in control group (Tables 2 and 3).

EMOTIONAL APPEARANCE, PAIN, FEAR, AND ANXIETY LEVELS OF GROUPS

Preprocedural emotional appearance scores were 18.8 (4.4) in VR group, 18.3 (4.2) in Buzzy group, and 20.1 (3.2) in control group. Postprocedure WBS pain scores were similar (VR = 5.6 (1.9), Buzzy = 5.8 (1.5), control = 6.0 (1.1). There were no differences in preprocedural emotional appearance scores and postprocedure pain scores ($P > .05$) (Table 4).

Postprocedure-related anxiety scores were 5.2 in the VR group, 5.1 in the Buzzy group, and 5.5 in the control group. There was no difference in postprocedural anxiety scores ($P > .05$). Postprocedure fear scores were 3.0 in the VR group, 2.9 in the Buzzy group, and 3.2 in the control group. There was a difference in postprocedure fear scores among the groups ($P < .05$). Although statistical difference was found, the difference among groups was less than 0.5 points on the 0 to 4-point scale (Table 4).

Discussion

VR and Buzzy technologies are used to reduce pain, fear, and anxiety associated with IV insertion.[12,14,33-39] Buzzy is used more frequently, and studies about Buzzy have generally focused on pain.[3,7,8,10-12] Studies carried out in PEDs about the effect of these technologies on IV insertion success are quite new.[14,20,33] Moreover, the number of studies assessing the effect of these methods on fear, anxiety, and distress in children is limited in the literature.[3,5,34] The pain and fear constructs are difficult to define among children compared with adults, as older children tend to express their feelings better than younger children.[30,35] In this study, we included children between the ages of 4 and 10 in the sample and the procedure-related pain, fear, and anxiety experienced by the children.

The primary outcome of this research was the first-attempt IV insertion success. No statistically significant relationship was found in terms of the first-attempt IV insertion success and IV insertion duration. First-attempt IV insertion success was almost similar in all groups (46%-50%). In other studies, the success rate of IV insertion seems to be variable in PEDs (41%-69%).[40,41] A successful IV insertion in a child is an exceedingly difficult process and requires the cooperation of the child and their family, as well as the knowledge, skills, and experience of health professionals. In a previous study, Schlechter et al[20] evaluated the efficacy of VR during IV placement to increase first-attempt IV success. Their primary endpoint was first-attempt IV success. First-attempt IV success rates were 81% in VR group and 84.2% in standard group (standard distraction techniques such as reading a book or iPad use). The successful IV insertion time was shorter in the group using VR; pain and anxiety scores of children also were similar between the groups.[20] Similarly, we found no difference in first-attempt IV insertion success and IV insertion time. Potts et al[33] found that there were no significant differences between the vibrating cold device and standard care 4% topical lidocaine cream group in first-attempt IV insertion success. The IV insertion time was significantly shorter in the vibrating cold device group, and there were no significant differences between groups for self-reported state or trait

TABLE 2
DIVA scores and PIVC demographics

Demographics	VR group			Buzzy group			Control group			Test	*P* value
	Mean	SD	Min-Max	Mean	SD	Min-Max	Mean	SD	Min-Max		
DIVA score	2.0	2.3	0-7	2.1	2.0	0-7	2.3	2.4	0-7	0.250*	.779
Based on DIVA score	*n*	%		*n*	%		*n*	%			
Easy IV access (<4 points)	31	60.8		29	58.0		26	53.1		0.623†	.732
Difficult IV access (≥4 points)	20	39.2		21	42.0		23	46.9			
The patient's skin condition											
Normal	28	54.9		27	54.0		25	51.0		0.676†	.954
Edematous	6	11.8		4	8.0		5	10.2			
Dehydrated	17	33.3		19	38.0		19	38.8			
PIVC area											
Right	8	15.7		12	24.0		10	20.4		1.098†	.577
Left	43	84.3		38	76.0		39	79.6			
Catheter size											
26G	17	33.3		14	28.0		22	44.9		5.040†	.283
24G	28	54.9		33	66.0		22	44.9			
22G	6	11.8		3	6.0		5	10.2			
First IV insertion success											
Successful	24	47.1		25	50.0		23	46.9		0.120†	.942
Unsuccessful	27	52.9		25	50.0		26	53.1			
Number of IV attempt for successful insertion											
1	24	47.1		25	50.0		23	46.9		1.127†	.890
2	13	25.5		13	26.0		10	20.4			
≥3	14	27.5		12	24.0		16	32.7			

IV, intravenous; DIVA, Difficult Intravenous Access; PIVC, peripheral intravenous catheterization.
* ANOVA
† Chi-square test

anxiety.[33] In another study, children's fear and anxiety before phlebotomy and difficult vascular access affected the first-attempt IV insertion success.[42] The stratified randomization was applied according to having difficult vascular access in this study. We thought that the success of the IV insertion might be affected by the presence of difficult vascular access. Although VR or Buzzy distractions did not make any difference in terms of first-attempt IV insertion success, pain, and anxiety in this study, we observed that children in intervention groups experienced less fear. This finding supported a previously published study by Chad et al.[43] There was less than a 0.5-point difference among the groups on a 5-point (0-4) scale in this study. A <1 point difference seems not to be of any clinical significance. Therefore, more studies are needed to evaluate the effectiveness of the VR or Buzzy intervention on fear and anxiety. In another study comparing VR and Buzzy, VR distraction reduced pain during blood collection, and no difference was found between the pain scores of the children in the VR and the Buzzy groups.[17] Tork et al[44] found that the children in the Buzzy group experienced less pain during IV insertion than the children in the control group. Semerci et al[45] found that pain scores were 3.40±3.56 in the Buzzy group and 3.76±3.06 in the control group; there was no difference in pain scores. In this study, there was no significant difference in terms of pain and anxiety, but the intervention groups had lower pain and anxiety scores. The VR and Buzzy interventions were more effective than

TABLE 3
Vital signs of groups

Demographics	VR group Mean	SD	Min-Max	Buzzy group Mean	SD	Min-Max	Control group Mean	SD	Min-Max	ANOVA Test	*P* value
Before IV insertion (Time 0)											
Pulse	122.0	99.3	101-148	122.9	132.7	88-178	122.7	100.7	88-178	0.108	.898
Respiratory	27.7	2.9	20-36	28.5	2.6	24-36	28.4	2.5	24-36	1.312	.272
Blood pressure /systolic	100.5	7.3	85-111	103.2	10.7	85-131	102.3	7.9	85-121	1.210	0.301
Blood pressure/ diastolic	64.6	10.3	43-85	65.7	10.9	48-100	65.1	7.6	50-78	0.141	.869
During the IV insertion (Time 1)											
Pulse	135.7	132.5	117-181	136.1	135.4	115-185	137.6	129.2	110-165	0.268	.766
Respiratory	31.3	3.5	26-40	32.2	3.3	24-42	32.1	3.3	24-42	1.101	.335
Blood pressure/ systolic	106.8	10.6	91-138	108.2	11.1	90-138	107.6	10.1	95-136	0.208	.812
Blood pressure/ diastolic	77.3	17.0	51-120	73.0	13.2	53-102	75.0	14.1	51-110	1.066	.347
5th minute of IV insertion (Time 2)											
Pulse	154.8	18.2	120-183	128.2	11.8	110-155	130.7	11.9	110-165	0.956	.387
Respiratory	29.4	3.3	24-38	29.6	2.7	24-36	30.1	2.6	24-36	0.623	.538
Duration of IV insertion (min)	10.5	5.4	4-25	11.3	7.7	3-45	9.9	4.1	5-20	0.685	.506

IV, intravenous.

TABLE 4
Emotional appearance, pain, fear, and anxiety levels of groups

Demographics	VR group Mean	SD	Min-Max	Buzzy group Mean	SD	Min-Max	Control group Mean	SD	Min-Max	Kruskal Wallis Test	*P* value
Pre-procedural											
Child Emotional Appearance Scale	18.8	4.4	6-25	18.3	4.2	7-25	20.1	3.2	7-24	4.988	.083
Post-procedural											
Wong-Baker	5.6	1.9	2-10	5.9	1.6	2-8	6.2	1.0	4-9	3.158	.206
FACES (WBS) Pain Rating Scale											
Color Analog Scale	5.9	1.5	2-9	5.8	1.5	2-9	6.0	1.1	3-8	0.218	.897
Child Fear Scale (CFS)	3.0	0.7	1-4	2.9	0.5	1-4	3.2	0.5	2-4	6.824	.033
Children's Anxiety Meter (CAM-S)	5.2	1.4	2-8	5.1	1.5	2-8	5.5	1.2	3-8	2.808	.246

KW, Kruskal–Wallis test.

distraction by asking questions. The effect of Buzzy or VR was generally demonstrated in phlebotomy or vaccination applications. As in this study, these distraction methods may have less effect on reducing pain and anxiety in PED. In a meta-analysis, it was found that large effect sizes indicated that VR was an effective distraction intervention to reduce pain and anxiety in pediatric patients during invasive procedures such as venous access, dental care, and burn care.[46] Studies using VR in the emergency department are very limited.[14,20,47,48] Although first-attempt IV insertion success in another study[40] was similar between groups (buffered lidocaine/no device), the effect of VR or Buzzy on increasing first-attempt IV insertion success was not observed in our study. It is recommended to conduct experimental studies in other age groups in PED to increase the clinical quality level of VR and Buzzy.

The emotional manifestation of the children before the procedure also was evaluated in this study. In all 3 groups, the children had similar emotional manifestation scores (ranging from 18 to 20 out of 25 points in the groups) and experienced negative emotional behaviors. The nonpharmacological methods can be planned by evaluating the emotional manifestation of children to increase their participation in the procedure and collaboration, especially in emergency departments. The difference in preprocedural emotional manifestation scores between the groups might not have been enough to reveal the effect of nonpharmacological interventions on children's pain, fear, and anxiety. No previous study evaluated the preprocedural emotional manifestation of children undergoing IV insertion in the emergency department. In this study, we aimed to draw attention to the emotional manifestation of children. Previous studies mostly evaluated the pain, fear, and anxiety of children after the procedure.[24,39]

In this study, vital signs were evaluated before, during, and after the IV insertion. There was no difference among the groups in terms of vital signs and the duration of the procedure. In the study by Sonmez Düzkaya et al,[2] the participants watched animations and cartoons before the procedure. A significant difference was found in blood pressure and pulse rates after the procedure.[2] In our study, as a standard approach, all patients were informed, the intervention was explained before the procedure, and the interaction was maintained by asking the child questions after the procedure. All IV insertions were performed by the same researcher PED nurse. In other studies, it is often unclear who applied the intervention, and the standard approach is not clearly stated by the researchers. The nurse's experience also may affect IV insertion success. The data collection process was planned in this way to control the nurse-induced variables. While it may reduce variability, it also may not allow for all differences to be generalizable.

Limitations

This study had limitations. All IV insertions were implemented by the same researcher PED nurse. Whereas distraction was achieved by talking in the control group, in the VR or Buzzy group, no distraction was provided by talking to show the effectiveness of the devices and to reduce confounding among the groups. The interaction was maintained in all groups after procedure. Pain, fear, and anxiety scales were administered to the children by another trained PED nurse who did not know which group the children belonged to. At the fifth minute after the procedure, the child evaluated the most pain, fear, and anxiety they felt during the procedure. Assessing the effect of the interventions on preprocedure and immediately postprocedure (without additional calming) fear/anxiety seems more clinically relevant if it is not possible to assess during procedure measurements. Five minutes after the end of the intervention, the child marked the score expressing the pain, fear, and anxiety felt during the intervention. This validated anxiety and fear scales based on scores; however, they may be inadequate to reveal pain, fear, and anxiety. Three or more attempts were made to insert the IV catheter in one-third of the children. For example, children with more than 3 attempts could be excluded from the study. We could have used a larger sample because of the redundancy of our secondary outcomes.

Implications for Emergency Nurses

Children have a complex perception of pain due to behavioral (crying, staying still), physiological (breathing and increased blood pressure, sweating, tears), psychological (restlessness, fear), and developmental factors. The child's response to pain varies according to the environment, perception of pain, developmental level, gender, and age. Whereas health professionals do not have time constraints to prepare the children who are admitted to the hospital in a planned manner for the hospital environment, illness, treatment process, etc, it is often not possible to prepare children who are brought to the emergency department with no appointment for this process. Unknown conditions, a chaotic environment, and environmental, psychological, and physical factors cause an increase in the fear and pain experienced by the child and may prevent adequate pain management. For this reason, studies can plan to reduce pain, fear, and anxiety, especially in the emergency department. Emergency nurses should try new nonpharmacological methods to increase first-attempt IV success. Before the procedure, the child and family should be involved in

the process and should plan for the use of nonpharmacological methods. While trying to reduce the child's pain, fear, and anxiety, this can ensure that the intervention is short, successful, and safe in the IV insertion. When planning nonpharmacological interventions, emergency nurses should consider the child's emotional manifestation and DIVA.

Conclusion

No difference was found in terms of first-attempt IV insertion success and vital signs before, during, and after the intervention. There was no difference among the VR, Buzzy, and control groups in terms of pain and anxiety, and the children in the VR and Buzzy groups experienced less fear. Although there was a statistically significant difference in fear 5 minutes after procedure among the 3 groups, this finding requires further investigation, as the clinical significance of the difference is uncertain. All distraction methods such as VR, Buzzy, or distraction by asking questions were helpful and effective in IV insertion.

Data, Code, and Research Materials Availability

Ethics approval: The procedures complied with ethical guidelines and received approval from the Non-Invasive Clinical Studies Ethics Committee of the Dokuz Eylül University (5891GOA 2021/12-46)

Consent to participate: The researcher obtained written consent forms from children and parents.

Consent for publication: The authors affirm that human research participants provided informed consent for publication of the data included in this publication.

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Author Disclosures

Conflicts of interest: none to report.

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Effectiveness of Procedural Sedation and Analgesia in Pediatric Emergencies. A Cross-Sectional Study

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Contribution to Emergency Nursing Practice

- What is already known about this topic? Pain is defined as an unpleasant emotional and sensory experience associated with bodily harm or with situations that cause fear and anxiety.
- What does this paper add to the currently published literature? There was high interrater agreement for the satisfaction between healthcare professionals and patients' families for effectiveness of all techniques used.
- What is the most important implication for clinical practice? Findings suggest that the efficacy of sedation-analgesia techniques can be improved to improve quality of care and patient comfort.

Abstract

Introduction: Pain is defined as an unpleasant emotional and sensory experience associated with bodily harm or with situations that cause fear and anxiety. However, it is often undertreated in pediatric emergency departments. This study aims to assess the effectiveness of sedation-analgesia techniques, level of satisfaction among health care professionals and relatives, and agreement between the satisfaction of health care professionals and relatives.

Methods: A cross-sectional design was conducted. Sociodemographic and clinical variables were recorded, together with those for effectiveness using the Face, Legs, Activity, Cry, and Consolability scale and the Wong-Baker FACES scale, and the satisfaction using the 10-point Likert scale. Stata 16.1 was used for data analysis.

Results: A total of 94 procedures were registered. The results suggested that these techniques were effective or mildly effective in only half of the cases. Satisfaction was considered good across the board, and the agreement between health care professionals (ie, pediatric nurses and pediatricians) was considered substantial. However, the agreement between health care professionals and relatives was moderate.

Discussion: Our results suggested that the adequate management of pain in pediatric emergency departments is still a challenge, despite the availability of international guidelines. Future research lines should be focused on analyzing possible causes of the inefficacy of some sedation-analgesia techniques and the causes of the differences between the perspectives of health care professionals and relatives. These research lines may be useful to improve quality of care and pediatric patient comfort.

Key words: Pediatrics; Emergency; Sedation; Effectiveness; Satisfaction

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Introduction

Pain is defined as "an unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage" according to the International Association for the Study of Pain Subcommittee on Taxonomy. This definition has become globally accepted

by professionals, including the World Health Organization.[1] This definition may not be sufficient when dealing with pediatric patients or individuals incapable of verbalizing their pain. Thus, one of the definitions that may be better adapted to this population is that "pain is a multifactorial personal experience with physiological, behavioral, emotional, developmental, and sociocultural components that can all lead to a different perception of pain."[2] According to the American Academy of Pediatrics,[3,4] proper pain management under sedation is crucial to promote patient welfare, control patient behavior, and ensure a positive psychological response to treatment.

Children in emergency departments usually undergo uncomfortable or stressful procedures, such as the establishment of venous access, wound suturing, or fracture reduction. Thus, the administration of sedation-analgesia and local anesthesia techniques to diminish pain, fear, and discomfort in infants is a frequent practice. Using sedation-analgesia in other settings different from the surgical setting is usually referred to as procedural sedation and analgesia (PSA).[5-8] However, despite the availability of international guidelines, pain experienced by pediatric patients in the emergency department is often inadequately managed.[7,9,10]

The Research in European Pediatric Emergency Medicine group conducted a multicenter study and recorded the most commonly used pharmacological techniques, professionals administering sedation-analgesia techniques, protocols used, facilitators and barriers, and degree of satisfaction of professionals.[7] The results evidenced that the most used drugs were midazolam and ketamine, followed by others such as intranasal (IN) fentaNYL and inhaled (inh) nitrous oxide. Pediatricians were the main professionals administering sedation-analgesia in an emergency setting and described certain issues that might limit proper pain management, including lack of training and an adequate place in the emergency department.[7] Along similar lines, Whitley et al[11] found different barriers to the management of pediatric pain in the emergency department, such as lack of experience, insufficient support from colleagues, difficulty assessing pain in children, and fear of adverse effects. In a pediatric ED context, Rybojad et al[9] compared evaluations of pain made by children, relatives, and professionals and their results indicated that children scored higher than the other groups did, suggesting that professionals in the emergency department may need more training in assessing pain in children.

In our context, the Sociedad Española de Urgencias en Pediatria (SEUP) considered effective pain control to be a quality-of-care indicator and hence recommended a series of core competences that health care professionals need to successfully manage pain in the emergency department.[12-15] Relevant studies on this matter include those published by Míguez-Navarro et al[16] and Míguez-Navarro et al.[17] The former assessed factors related to the effectiveness of sedation-analgesia and the adverse effects of drugs. Their findings suggest that PSA is a common practice in the pediatric emergency department, and a safe one as a low rate of adverse effects was found. However, the results also demonstrate that PSA is only partially effective. The latter assessed the prevalence of pain in the pediatric emergency department and the interrater agreement between health care professionals and families regarding pain level. More than half of the sampled pediatric patients in the emergency department experienced pain, thus highlighting the importance of correct, effective pain management.

Finally, the safety of these techniques also has been analyzed, examples being the recent research conducted by Lucich et al,[18] Schlegelmilch et al,[19] and Sirimontakan et al,[8] which observed a low incidence of adverse effects, even in children aged <2 years. Only 3.9% of cases presented adverse effects, namely digestive (nausea), respiratory (desaturation, laryngospasm, apnea), and others (rash, hypotension, hypertension). Therefore, despite sedation-analgesia techniques always entailing certain risks,[8,18,20] the low incidence of adverse events suggests that they could be safe in an pediatric emergency department.

Despite literature and evidence provided, the effective management of pain in children still seems to be a challenge in the emergency department. Therefore, we decided to conduct this study to describe the sedation-analgesia techniques used in our pediatric emergency department, the focus being on assessing the effectiveness of sedation-analgesia and local anesthesia techniques, the degree of satisfaction among health care professionals (pediatric nurses and pediatricians) and relatives, and the interrater agreement between the satisfaction of health care professionals and relatives.

Methods

DESIGN, SETTING, AND PARTICIPANTS

This cross-sectional study is reported in accordance with Strengthening the Reporting of Observational Studies in Epidemiology guidelines.[21] This study was conducted in an urban Spanish pediatric emergency department of a secondary care hospital, with an annual attendance of 28,000 patients and an average of 18 sedations per month.

Inclusion criteria were children aged 0 to 18 years who required sedation-analgesia or local anesthesia techniques

for painful or uncomfortable procedures, from October 2020 to July 2021. This age range was selected, because in our hospital patients up to 18 years of age are cared for by pediatricians. Parents and patients aged 12 years or older (considered mature) signed informed consent forms. Patients whose parents did not issue their consent, patients who were hemodynamically unstable, and patients with major language barriers were excluded from the study.

SAMPLE SIZE

Calculation sample size was a priori, with a confidence level of 95%, precision of 10%, and prevalence of sedation-analgesia techniques of 50% (maximizing the sample size), with a total of 96 participants.[22]

STUDY VARIABLES

Sociodemographic variables of age, sex, and weight were recorded. Variables related to procedures, sedation-analgesia techniques, drug dosage and administration, adverse effects, and vital signs (oxygen saturation, heart, and respiratory rate) also were recorded. The effectiveness of pharmacological techniques was assessed using the Face, Legs, Activity, Cry, and Consolability scale (FLACC)[23,24] and the Wong-Baker FACES scale when infants were older than 4 years, conscious, and/or undergoing local anesthesia only. The satisfaction of health care professionals and relatives was evaluated by only one question, assessed on a 10-point Likert scale.[25]

INSTRUMENTS

FLACC Scale

The FLACC is a validated behavioral scale for the assessment of procedural pain in children younger than 4 years undergoing mild, moderate, or severe sedation-analgesia in intensive care, emergency, oncology, surgery, and traumatology. An observer recorded the scores as (0) "no pain," (1-3) "mild pain," (4-6) "moderate pain," and (7-10) "severe pain," assessing items related to facial expression, limb position, crying, and comforting ability. The literature describes high interrater reliability, intra-class correlation coefficient = 0.87 (95% CI 0.84-0.89).[24]

Wong-Baker FACES Face Scale

The Wong-Baker FACES[26] is a validated self-assessment scale for the evaluation of pain in children older than 3 years. It scores the degree of pain based on 6 different images of visual expressions that depict (0) "no pain," (2) "hurts a little," (4) "hurts a little more," (6) "hurts a lot," (8) "hurts a lot more," and (10) "hurts the most." The meaning of each face is explained to the children, who are asked to point to the one that best expresses their pain. This scale has been validated for the assessment of procedural pain, showing high correlation with the visual analog scale (r = 0.90; 95% CI 0.08-0.93).[27]

Likert Scale to Evaluate Satisfaction

A 10-point Likert scale[25] was used to evaluate the satisfaction of health care professionals and relatives. The question was "What is your level of satisfaction regarding the effectiveness of sedation technique used during the procedure?" Answer ranged between 1 (not at all satisfied) and 10 (totally satisfied).

PROCEDURE

Our emergency department exclusively attends pediatric patients with different pathologies. The care of pediatric patients undergoing sedation-analgesia and local anesthesia techniques is multidisciplinary, that is, auxiliary nurses, pediatric nurses, and pediatricians.[28] The pharmacological strategy is usually performed according to our protocol (Table 1), based on recommendations of the SEUP.[14] This protocol is flexible and offers a wide variety of pharmacological strategies to be adapted to the procedure, intensity of pain, and patient. The sedation strategy is always the responsibility of the senior pediatrician, although other professionals may collaborate (eg, traumatologist).

Pediatric nurses, together with auxiliary nurses and pediatricians, are responsible for patient monitoring, establishing peripheral venous access for drug administration, and controlling possible adverse reactions, as well as enhancing patient and family comfort. Pediatric nurses assisted this study by informing parents, obtaining a written consent, administering different drug combinations, evaluating the effectiveness of sedation-analgesia and local anesthesia techniques using the FLACC scale or the Wong-Baker FACES scale, respectively, and recording the satisfaction of health professionals and relatives. An ad hoc form was designed for data collection, where each sheet was identified with a number only to respect confidentiality and anonymity.

DATA ANALYSIS

Data analysis was performed using Stata 16.1 (StataCorp LLC) and the results were reported in accordance with the "Statistical Analyses and Methods in the Published Literature"[29]

TABLE 1
Protocol of sedation-analgesia in our pediatric emergency department

Procedures	Not painful procedures	Moderate painful procedures	Substantial painful procedures
	Radiography (X-ray)	Wound suture	Fracture reduction
	Ultrasound scan	Lumbar punction	Burns care
Recommended drug combinations	Midazolam (IV, IN)	Midazolam (IV, IN)	Nitrous oxide + another drug (IV)
		Nitrous oxide (inh)	Midazolam + fentaNYL
		Propofol (IV)	Midazolam + ketamine
		Anesthetic gel	Propofol + fentaNYL
		Anesthetic cream	Propofol + ketamine
		Lidocaine (SC)	Ketamine
			Midazolam (IN) + fentaNYL (SC, IM)
			Midazolam (IN) + Ketamine (IM)
Nonpharmacological techniques: distraction, sucrose			

Anesthetic gel = lidocaine 1.5%; adrenaline, 0.1%; y tetracaine, 1%; anesthetic cream = 25 mg de lidocaine and 25 mg de prilocaine.
IV, intravenous; IN, intranasal; o, oral; inh, inhaled; sc, subcutaneous; IM, intramuscular.

guidelines. Normality of data distribution was analyzed using the Shapiro-Wilk test. The descriptive analysis reported the means, standard deviation, medians, interquartile range, frequencies, and percentages. Differences between groups were analyzed using the Mann-Whitney test for quantitative non-normal data and chi-square for categorical variables.

The effectiveness of the most used pharmacologic techniques was evaluated by analysis of variance, with multiple comparisons counteracted by Bonferroni correction. Levene's test showed homogeneity of variances ($P = .06$). Interrater agreement with regard to satisfaction was evaluated using Krippendorff's alpha coefficient for ordinal scales, using Landis and Koch (1977) scale criteria for interpretation.[30,31] Significance was $P < .05$ for all statistics.

ETHICAL ASPECTS

This study was approved by the Ethics and Medicines Research Committee of the Consorci Sanitari de Terrassa, Barcelona, Spain (CEIM Ref. 01-20-103-067). It was conducted in accordance with the principles of the Helsinki Declaration of 1975 and subsequent revisions and in consideration of Spanish Organic Law 3/2018, of December 5, on the Protection of Personal Data and Guarantee of Digital Rights, and Regulation (European Union) 2016/679 on the protection of natural persons regarding processing of personal data and on the free movement of such data. Parents and patients aged 12 years and older (considered mature) signed the informed consent form.

Results

The sample characteristics and procedures performed are presented in Table 2. The total number of sedation procedures was 162, and the sample was composed of 95 of 162 participants (58.6%), but one subject was removed owing to missing data. No refusals were recorded.

In the final sample of 94 of 162 participants (58.0%), 48 were boys (52.1%), with mean age of 8.5 years (SD = 5.3), and 46 (48.8%) were girls, with mean age of 8.4 years (SD = 5.1). We observed no differences between boys and girls with respect to age. A total of 80 procedures (85.1%) were performed involving mild, moderate, or severe sedation-analgesia, and 14 procedures (14.9%) were performed involving local anesthesia only. The most frequent procedures were wound suturing ($n = 30$ [31.9%]) and fracture reduction ($n = 26$ [27.7%]). A total of $n = 91$ participants (96.8%) were monitored with a pulse oximeter, recording oxygen saturation, heart rate, and respiratory rate. In addition, all children were accompanied by their relatives, with the exception of 1 mother who reported that she was sick.

The most commonly used drugs are presented in Table 3. The most frequent drug combination was midazolam (intravenous [IV]) + ketamine (IV) ($n = 26$ [28.6%]). In 15 of 94 cases (16.0%), anti-inflammatory drugs also were administered (eg, metamizole, IV). Common adverse reactions were digestive reactions, vomiting and nausea ($n = 1$ [1.1%]), and respiratory and desaturation difficulties ($n = 2$ [2.2%]). Digestive reactions were self-limited and did not require intervention. Desaturation episodes required

TABLE 2
Sample characteristics: age, sex, and procedures

Sample	**N = 94**					
		Boys		Girls		*P* value
Age		n	(%)	n	(%)	
	< 4 y	15	(31.3)	14	(30.4)	
	4-8 y	7	(14.6)	7	(15.2)	
	8-12 y	11	(22.9)	13	(14.9)	
	12-18 y	15	(21.3)	12	(26.1)	
	Total	48	(52.1)	46	(48.8)	.92*
Age		m(SD)	Md (P25-P75)	m (SD)	Md (P25-P75)	
		8.5 (5.3)	9.1 (3.4-13.1)	8.4 (5.1)	8.3 (3.3-13.0)	.86†
		Sedation-analgesia		Local anesthesia		Total
One procedure only		n	(%)	n	(%)	n (%)
	Total	80	(85.1)	14	(14.9)	94 (100)
	Fracture reduction	21	(26.3)			21 (27.7)
	Wounds suture	19	(23.8)	10	(71.4)	29 (30.1)
	Burns care	9	(11.3)	1	(7.1)	10 (10.6)
	Peripheral access	5	(6.3)			5 (12.3)
	Wounds care	2	(2.5)			2 (2.2)
	Lumbar puncture	1	(1.3)			1 (1.1)
	Abscesses care			2	(14.2)	2 (2.2)
One or more procedures						
	Peripheral access + fracture	5	(6.3)			5 (12.3)
	Burns + ophthalmic care	1	(1.3)			1 (1.1)
	Peripheral access + wounds	1	(1.3)			1(1.1)
	Peripheral access + suture	1	(1.3)			1(1.1)
	Other situations‡	15	(18.7)	2	(14.2)	16 (17.0)

m, mean; Md, median; P25, percentile 25; P75, percentile 75.
* Chi-square test for proportions.
† Mann-Whitney test for means.
‡ Other (X-ray, ophthalmic examination, etc).

oxygen therapy support. Adverse events were associated to the combination of ketamine IV + midazolam IV only.

The scores for the FLACC and Wong-Baker FACES scales are presented in Table 4. The mean for the FLACC scale was 2.1 (SD = 2.7), and the mean for the Wong-Baker FACES scale was 5.9 (SD = 3.3). A total of 36 procedures (38.3%) was scored as zero, that is, no pain, and 21 (22.3%) were scored as mild pain, whereas the remaining procedures were scored as moderate or severe pain. Moreover, in 16 of 94 cases (17.0%), signs of pain, such as tachycardia, facial grimacing, moaning, and crying, were annotated by pediatric nurses. In all cases, drugs were administered according to the established protocol, with doses adjusted by weight; mean dose of midazolam was 0.14 mg/kg (SD = 0.1), mean dose of ketamine was 1.1 mg/kg (SD = 0.5), and mean dose of fentaNYL was 1.3 micrograms/kg (SD = 0.4). Drug administration was intravenous (IV), intranasal (IN), subcutaneous, (SC), or inhaled (inh), depending on the case.

The FLACC scores for sedation techniques, together with the analysis of variance to evaluate their effectiveness, are presented in Table 5. Owing to the wide variety of pharmacological techniques and the small sample, this analysis was conducted for the most used sedation techniques

TABLE 3
Sedation-analgesia techniques and local anesthesia

One drug only			Drugs combinations		
	n	(%)	Two drugs	n	(%)
Midazolam IN	8	(8.8)	Ketamine IV + midazolam IV	26	(28.6)
FentaNYL IN	7	(7.7)	Midazolam IN + nitrous oxide inh	4	(4.4)
Nitrous oxide inh	6	(6.6)	FentaNYL IN + nitrous oxide inh	4	(4.4)
Anesthetic gel	6	(6.6)	Mepivacaine SC + anesthetic gel	3	(3.3)
Lidocaine SC	2	(2.2)	Midazolam IN + anesthetic gel	2	(2.2)
Mepivacaine SC	2	(2.2)	Propofol IN + morphine SC	1	(1.1)
Morphine SC	1	(1.1)	Three drugs		
			Midazolam IV + ketamine IV + fentaNYL IV	4	(4.4)
			Midazolam IN + ketamine IV + nitrous oxide	2	(2.2)
			Midazolam IN + ketamine IV + mepivacaine SC	2	(2.2)
			Other combinations less frequent (3 drugs)	14	(15.0)

Percentages with respect to the total of procedures ($n = 94$).
IV, intravenous; IN, intranasal; SC, subcutaneous; inh, inhaled.

only, that is, midazolam (IV) + ketamine (IV), midazolam (IN), fentaNYL (IN), and nitrous oxide (inh). Multiple comparisons showed statistically significant differences between techniques. Midazolam (IN) alone was not as effective as either the combination of ketamine (IV) + midazolam (IV) ($P = .008$) or the use of nitrous oxide (inh) ($P = .033$). It is noted that the combination of ketamine (IV) + midazolam (IV) was generally used for major procedures, such as fracture reduction or complicated wound sutures, whereas nitrous oxide (inh) or midazolam (IN) was generally used for minor procedures, such as peripheral access or wound sutures. No further differences between techniques were found.

The satisfaction of health professionals and relatives and interrater agreement are presented in Table 6. Satisfaction was assessed using the Likert scale and the agreement using Krippendorff's alpha coefficient for ordinal scales. Satisfaction with all techniques was good: nurses (mean [m] = 7.9; 95% CI 7.4-8.4), pediatricians (m = 8.0; 95% CI 7.5-8.5), and family (m = 8.1; 95% CI 7.6-8.6). Satisfaction with sedation-analgesia techniques also was good: nurses (m = 8.1; 95% CI 7.6-8.7), pediatricians (m = 8.3; 95% CI 7.8-8.8), and relatives (m = 8.4; 95% CI 7.9-8.8). However, satisfaction with local anesthesia techniques was only acceptable: nurses (m = 6.4; 95% CI 4.6-8.4), pediatricians (m = 6.0; 95% CI 3.9-8.1), and relatives (m = 6.3; 95% 4.3-8.4). Interrater agreement among pediatric nurses, pediatricians, and relatives was substantial for all techniques according to the established criteria (alpha = 0.79; 95% CI 0.71-0.87). However, agreement per pair of raters was slightly lower when sedation-analgesia techniques were evaluated; agreement among pediatric nurses and relatives was alpha = 0.68 (95% CI 0.51-0.83), and between pediatricians and relatives, it was alpha = 0.63 (95% CI 0.46-0.80). Although the alpha values suggested substantial agreement, the 95% CI suggested that this agreement might be moderate.

Discussion

To the best of our knowledge, this is the first study to have assessed the effectiveness of sedation-analgesia and local anesthesia techniques together with satisfaction and interrater agreement between health care professionals and relatives. Our results showed that we usually use pharmacological techniques to manage pain in our pediatric emergency department, to promote patient comfort and well-being during painful procedures, in accordance with the recommendations of the American Academy of Pediatrics[3,4] and the SEUP.[12,13,32]

Our findings describe a wide variety of techniques, and in line with previous studies, midazolam together with ketamine was the most used drug combination.[7,16,33] In addition, and despite the small sample size, it is noteworthy

TABLE 4
FLACC and Wong-Baker FACES scoring

Scales	**FLACC**			**Wong-Baker FACES**			**Total**	
	Scoring	n (%)	Cum (%)	Scoring	n (%)	Cum (%)	n	(%)
	0	35 (43.8)	43.8	0	1 (7.1)	7.1	36	38.3
	1-2	19 (23.8)	67.6	2	2 (14.3)	21.4	21	22.3
	3-4	13 (16.3)	83.9	4	3 (21.4)	42.8	16	17.0
	5-6	6 (7.5)	91.4	6	2 (14.3)	57.1	8	8.5
	7-8	1 (1.3)	92.7	8	3 (21.4)	78.5	5	5.3
	9-10	5 (6.3)	100	10	3 (21.4)	100	8	8.5
	Total	80 (100%)	100	Total	14 (100)	100	94	100
		m (SD)	Md (P25-P75)		m (SD)	Md (P25-P75)		
		2.1 (2.7)	1 (0-3)		5.9 (3.3)	6 (4-8)		

FLACC, Face, Legs, Activity, Cry, and Consolability; Cum, cumulative percentage; m, mean; Md, median; P25, percentile 25; P75, percentile 75.

that we observed a low incidence of adverse effects, which occurred in the combination of ketamine plus midazolam only. Our results also indicate that these techniques were effective or mildly effective in only half of the cases. Despite the different evaluation method, these results seem to be similar to those reported by Míguez et al[16] in which two-thirds of evaluated techniques were considered good (patient collaboration and lack of recall) or partially good (some degree of pain and anxiety), and one-third were classified as poor (no collaboration and poor recall). When

TABLE 5
Analysis of variance: effectiveness of the most used sedation-analgesia techniques

Scales	**FLACC**	**Ketamine IV + midazolam IV**	**Midazolam IN**	**FentaNYL IN**	**Nitrous oxide inh**	**ANOVA (F 4.60, df 3)**		
$n = 47$						*P* value	R^2	R^2Adj
						.007	0.24	0.20
	n (%)	26 (55.3)	8 (17.0)	7 (14.9)	6 (12.8)			
	m (SD)	1.8 (2.3)	5.5 (3.7)	3.4 (3.1)	1.3 (1.6)			
	Md (P25-P75)	1 (0-3)	4.5 (2.5-9.5)	3 (1-4)	1 (0-2)			

Multiple comparisons by Bonferroni

Sedation-analgesia techniques	Contrast	Std Err	95% CI	*P* value
Midazolam (IN) vs (ketamine IV + midazolam IV)	3.7	1.10	0.69-6.60	.008
FentaNYL (IN) vs (ketamine IV + midazolam IV)	1.6	1.13	−1.53 to 4.70	> .99
Nitrous oxide (inh) vs (ketamine IV + midazolam IV)	−0.5	1.20	−3.82 to 2.80	> .99
FentaNYL (IN) vs midazolam (IN)	−2.1	1.40	−5.90 to 1.71	.824
Nitrous oxide (inh) vs midazolam (IN)	−4.2	1.42	−8.11 to −0.22	.033
Nitrous oxide (inh) vs fentaNYL (IN)	−2.1	1.50	−6.20 to 1.97	.969

IV, intravenous; IN, intranasal; inh, inhaled; cum, cumulative percentage; m, mean; Md, median: P25, percentile 25; P75, percentile 75; ANOVA, analysis of variance; F, F of Snedecor; df, degrees of freedom; R^2, R squared; R^2Adj, R^2 adjusted; Std err, standard error; CI, confidence interval.

TABLE 6
Satisfaction and interrater agreement

General satisfaction: all techniques

	m	95% CI	Md	P25-P75
Nursing	7.9	7.4-8.4	8.5	7-10
Pediatricians	8.0	7.5-8.5	9.0	7-10
Relatives	8.1	7.6-8.6	9.0	7-10

Satisfaction with sedation-analgesia techniques only

	m	95% CI	Md	P25-P75
Nursing	8.1	7.6-8.7	9.0	7-10
Pediatricians	8.3	7.8-8.8	9.0	7-10
Relatives	8.4	7.9-8.8	9.0	8-10

Satisfaction with local anesthesia techniques only

	m	95% CI	Md	P25-P75
Nursing	6.4	4.6-8.4	6.5	4-10
Pediatricians	6.0	3.9-8.1	6.0	4-9
Relatives	6.3	4.3-8.4	6.5	4-10

Interrater agreement. All techniques

	Nursing vs ped vs relatives		Nursing vs ped		Nursing vs relatives		Ped vs relatives	
	Coefficient	95% CI	Coefficient	95% CI	Coefficient	95% CI	Coefficient	95% CI
Percent agreement	0.97	0.95-0.98	0.97	0.95 -1.00	0.95	0.94-0.98	0.95	0.93-0.98
Krippendorff's alpha*	0.79	0.71-0.87	0.88	0.82-0.94	0.75	0.63-0.86	0.72	0.60-0.85

Interrater agreement with sedation-analgesia techniques only

	Nursing vs ped vs relatives		Nursing vs ped		Nursing vs relatives		Ped vs relatives	
	Coefficient	95% CI	Coefficient	95% CI	Coefficient	95% CI	Coefficient	95% CI
Percent agreement	0.96	0.95-0.97	0.98	0.97-0.99	0.95	0.94-0.97	0.95	0.93-0.97
Krippendorff's alpha*	0.72	0.61-0.84	0.87	0.79-0.94	0.68	0.51-0.83	0.63	0.46-0.80

Interrater Agreement with local anesthesia techniques only

	Nursing vs ped vs relatives		Nursing vs ped		Nursing vs relatives		Ped vs relatives	
	Coefficient	95% CI	Coefficient	95% CI	Coefficient	95% CI	Coefficient	95% CI
Percent agreement	0.97	0.95-0.99	0.96	0.80-1,00	0.97	0.95-0,99	0.97	0.80-1.00
Krippendorff's alpha*	0.91	0.83-0.99	0.87	0.75-0.99	0.92	0.85-0.99	0.90	0.79-1.00

Ped, pediatricians; m, mean; CI, confidence interval; Md, median; P25, percentile 25; P75, percentile 75.

* Landis and Koch scale: <0.0, poor; 0.0-0.20, slight; 0.21-0.40, fair; 0.41- 0.60, moderate; 0.61-0.80, substantial; 0.81-1.00, almost perfect.

effectiveness of the most used techniques was compared, our findings suggested that midazolam (IN) alone may be less effective than other regimes, despite it only being used in minor procedures, as recommended.[14]

In general, sedation-analgesia and local anesthesia techniques were not as effective as expected, supporting the notion that the experience of pain in children in the emergency department is often poorly treated, as Benini et al[10] and Rybojad et al[9] also noted. This may be associated to several factors. One of these could be the lack of professional training in the management of these techniques, as reported by Sahyoun et al[7] and Rybojad et al,[9] and another might be the fear of certain adverse effects, as reported by Márquez et al.[15] To this concern, it should be noted that although training courses of sedation are conducted in our emergency department, these are less frequent than is desirable. In this line, it is noteworthy that the proper management of pain may be related to expertise in PSA, which is considered a core competency in emergency medicine and pediatric emergency medicine in different countries, such as the United States, Canada, Australia, and Switzerland.[6] These countries formally recognize this specialty, so professionals are trained to have specific skills to provide adequate levels of sedation-analgesia and to manage the possible adverse effects.[6]

Finally, our results showed a generally acceptable degree of satisfaction. These findings were also in line with previous research.[16] Interrater agreement between health professionals and relatives was moderate when general techniques were considered, whereas for local anesthesia it was substantial, almost perfect. The higher-than-expected scores for the Wong-Baker scale suggest that agreement was related to dissatisfaction rather than to satisfaction. Future research should conduct qualitative studies with a view to understanding the causes for the ineffectiveness of some techniques and the reasons for the differences between the health care professionals' and relatives' perspectives.

Limitations

Our findings should be interpreted in the light of certain limitations. First, there is possible bias derived from work overload in certain shifts, making difficult the register of all procedures realized during these 9 months. For this reason, most of these records were made in the morning, which limited the sample size and the type of procedures. Second, no record was made of nonpharmacological interventions, such as distraction and sucrose. Finally, because the data were collected in a regional hospital, generalization of our results may be limited. However, it is important to stress that our findings were very similar to those reported by some multicenter studies.

In contrast, this study has some strengths. First, it highlighted the importance of using sedation-analgesia and local anesthesia in the pediatric emergency department. Second, it has assessed and compared the effectiveness of the most used sedation techniques, noting the need to improve pain management. Third, it has assessed the satisfaction interrater agreement between health care professionals and relatives, which no similar studies were found to have done. The findings indicate different perspectives with regard to the effectiveness of the sedation-analgesia and local anesthesia techniques, noting the need for relatives to be involved in these procedures, and for their opinions and perspectives to be considered.

Implications for Emergency Nurses

The perspective, knowledge, and experience of nurses should be considered in this context, given that the enhancement of patient comfort is a core competency.[34,35] Comfort is a holistic construct, including ease and relief in physical, social, psychospiritual, and environmental contexts. Because patients need and want to be comforted, nurses require an efficient framework in which to facilitate this in the context of their emergency daily practice.[34,35] Actions such as meeting family needs and/or applying nonpharmacological techniques (eg, distraction) are crucial for improving both patient comfort and family satisfaction. The literature reported a wide variety of such nonpharmacological strategies for use either in isolation or together with sedation-analgesia techniques.[36] The inclusion of these strategies in daily practice may be beneficial for improving pain management in the pediatric emergency department.

Conclusions

Pain management is considered an indicator of quality of care. However, proper pain management is still a challenge in the pediatric emergency department. Based on findings, we recommend a review of sedation-analgesia and local anesthesia training programs to provide health care professionals with specific skills and competencies in pain management. Formal recognition of this specialty may be crucial to improve our quality of care in the emergency department. Moreover, we recommend routine assessment of the effectiveness of these techniques using validated

scales, which will enable comparison of results among different pediatric emergency departments. We also recommend taking into account relatives' assessments of the effectiveness of sedation-analgesia and local anesthesia techniques. The role of pediatric nurses may be crucial during this process for ensuring that family needs are met and nonpharmacological techniques are properly used. Further research lines also should analyze possible interactions between pharmacological and nonpharmacological techniques. These strategies may improve the effectiveness of sedation-analgesia and local anesthesia techniques and the comfort of pediatric patients.

Author Disclosures

Conflicts of interest: none to report.

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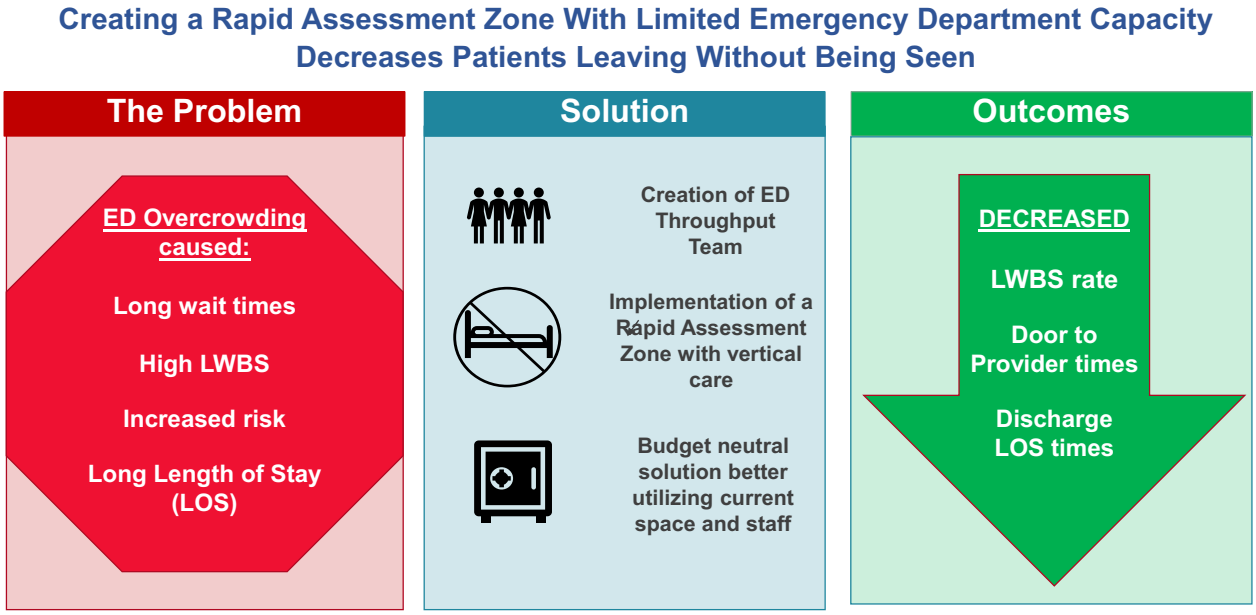
Creating a Rapid Assessment Zone with Limited Emergency Department Capacity Decreases Patients Leaving Without Being Seen: A Quality Improvement Initiative

Authors: Jayne Faber BSN, RN, Justin Coomes MD, Michael Reinemann MSN, RN, and Jestin N. Carlson MD, MS, MHA, Canton and Fairfield, OH and Pittsburgh, PA



Creating a Rapid Assessment Zone with Limited Emergency Department Capacity Decreases Patients Leaving Without Being Seen: A Quality Improvement Initiative

Authors: Jayne Faber, BSN, RN, Justin Coomes, MD, Michael Reinemann, MSN, RN, and Jestin N. Carlson, MD, MS, MHA, Canton and Fairfield, OH and Pittsburgh, PA

Contribution to Emergency Nursing Practice

- Rapid assessment zones, a type of vertical care model, may be helpful in expediting patient care and reduce the number of patients who leave without being seen.
- This paper describes how one emergency department used an interdisciplinary team of emergency nurses, ED providers, and ED leaders (medical director, charge nurses, and managers) to successfully implement a rapid assessment zone to reduce the rate of patients leaving without being seen.
- The results reported in this manuscript may be used to help other emergency departments implement similar projects to reduce their rates of patients leaving without being seen, arrival to provider time, and length of stay for both discharged and admitted ED patients.

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Abstract

Introduction: Patients leaving the emergency department before treatment (left without being seen) result in increased risks to patients and loss of revenue to the hospital system. Rapid assessment zones, where patients can be quickly evaluated and treated, have the potential to improve ED throughput and decrease the rates of patients leaving without being seen. We sought to evaluate the impact of a rapid assessment zone on the rate of patients leaving without being seen.

Methods: A pre- and post-quality improvement process was performed to examine the impact of implementing a rapid assessment zone process at an urban community hospital emergency department. Through a structured, multidisciplinary approach using the Plan, Do, Check, Act Deming Cycle of process improvement, the triage area was redesigned to include 8 rapid assessment rooms and shifted additional ED staff, including nurses and providers, into this space. Rates of patients who left without being seen, median arrival to provider times, and discharge length of stay between the pre- and post-intervention periods were compared using parametric and nonparametric tests when appropriate.

Results: Implementation of the rapid assessment zone occurred February 1, 2021, with 42,115 ED visits eligible for analysis; 20,731 visits before implementation and 21,384 visits after implementation. All metrics improved from the 6 months before intervention to the 6 month after intervention: rate of patients who left without being seen (5.64% vs 2.55%; $c^2 = 258.13$; $P < .01$), median arrival to provider time in minutes (28 vs 11; $P < .01$), and median discharge length of stay in minutes (205 vs 163; $P < .01$).

Discussion: Through collaboration and an interdisciplinary team approach, leaders and staff developed and implemented a rapid assessment zone that reduced multiple throughput metrics.

Key words: Throughput; Crowding; Emergency department; Rapid assessment zone

Introduction

ED crowding and boarding, the practice of holding patients in the emergency department until an in-hospital bed is available, has been associated with increased in-hospital mortality and delays in care.[1,2] ED crowding also results in patients leaving without being seen (LWBS) by a provider, which increases the risk of adverse events in high-risk populations that need treatment and also contributes to lost revenue.[3,4] For these reasons, LWBS rates represent a key ED performance metric.

Nationally, LWBS rates vary substantially between hospitals[5]; however, one key predictor of ED LWBS rates is the time from when patients check in until they are seen by a provider, also known as "arrival to provider" time.[6,7] Efforts to reduce "arrival to provider" time often realign ED resources, including placing a provider (physician or advanced practice provider) in triage and cohorting inpatient overflow patients ("ED boarders") in one area.[8,9] In addition, rapid assessment zones (RAZs) have been proposed as a way to shift ED providers, nurses, and technicians to the front end of the emergency department to expedite assessment and treatment.[10] Early assessment includes identification of patients who do not require physical bed space, thereby conserving ED bed space and other resources for higher-acuity patients. RAZs also can incorporate evidence-based, nurse-initiated orders and facilitate treatment and discharge of low acuity patients from the waiting room.[11] In 2019, our hospital noted increased LWBS rates. As part of a quality improvement project, we implemented a RAZ with a vertical care model and examined its impact on ED LWBS rates, arrival to provider times, and ED discharge length of stay (DLOS). Although the project focused on the implementation of ED-specific initiatives, we also examined the impact on length of stay (LOS) for admitted patients and LOS for all ED patients.

Methods

DESIGN AND SETTING

We performed a single-site quality improvement initiative examining the impact of a RAZ on commonly measured ED operational metrics before and after intervention. The ED Medical Director was approached by hospital leadership and asked to reduce LWBS rates, which were as high as approximately 8% in certain months of the preimplementation measurement period, compared with the hospital's internal goal of a LWBS rate of $< 2\%$. The ED sees roughly 40,000 patients annually. Before the creation of the RAZ, the ED had 23 treatment rooms, with 8 additional treatment spaces in the front of the department that were formerly used as a "Fast Track" treatment area. These 8 spaces were incorporated into the triage area during the creation of the RAZ (Figure 1). This work was approved by the Allegheny Health Network Institutional Review Board.

OVERVIEW OF RAZ

In response to ED crowding and suboptimal performance metrics (eg, LWBS of approximately 8%), we assembled a multidisciplinary throughput team composed of US Acute Care Solutions (USACS) clinical leaders from the Clinical Resource Group, ED leaders, providers, emergency nurses, and support staff to redesign front-end flow and serve as process champions. The ED providers at Mercy Health-Fairfield Hospital are employed by USACS, and the Clinical Resource Group is an internal USACS quality improvement and implementation team who provides quality and process improvement services to hospital partners at no additional cost to the organization. Our focus was to create a rapid assessment and vertical care model to best use the existing footprint of the emergency department, expedite initial provider and nurse triage assessments, determine patient placement into the appropriate care area, and expedite testing, thereby decreasing the LWBS rates and decreasing the DLOS.[12]

The RAZ was created using an existing 8-bay treatment zone in the front end of the emergency department to be used from 7 AM to 10 PM daily (Figure 1). This 8-bay area was formerly the department's "Fast Track" area, which during the COVID-19 pandemic was largely unused space. Staff resources were shifted to the front end to operate the RAZ with triage nurse(s), an ED technician, and a phlebotomist. Before the process change, there was 1 triage nurse at all times, and as staff expanded during the day, there were 2 triage nurses from 11 AM to 11 PM, 1 technician assigned to triage, and 1 phlebotomist for the department. Triage patient flow prior to process change was linear. Patients were quick registered by a member of the registration team and brought into one triage room by the triage nurse for assessment by the triage nurse who then entered preapproved protocol orders before sending patients back to the waiting room. Patients were called to a blood draw area for testing to be initiated

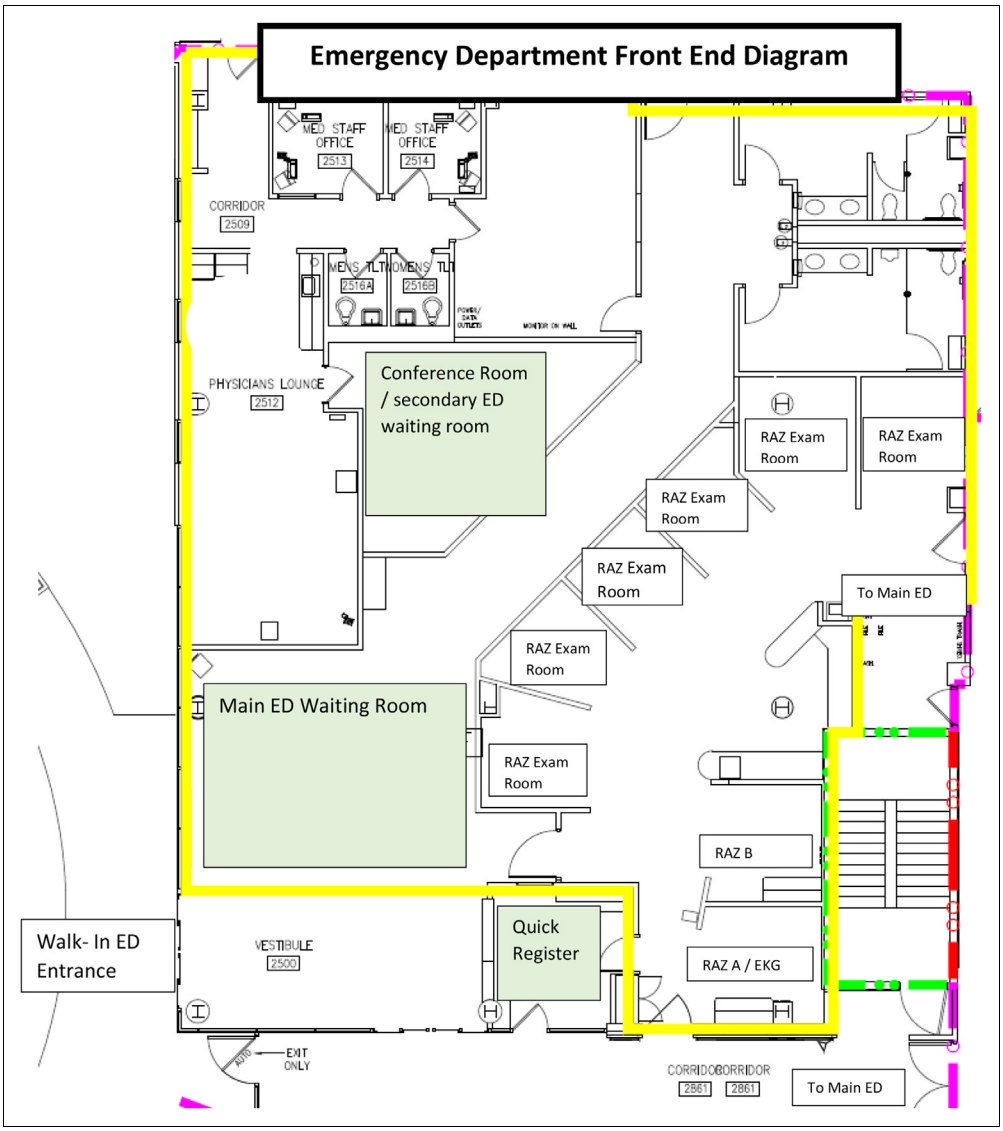

FIGURE 1

Layout of the rapid assessment zone and patient flow—ED front-end diagram. RAZ, rapid assessment zone; ED, emergency department; EKG, electrocardiogram.

by the triage tech or phlebotomist when they were available. Following this obtaining of specimens, patients were sent back to the waiting room, where staff from imaging would pick up and return patients if imaging studies were ordered.

Implementation of the RAZ process created a front-end team composed of the triage nurse(s) and triage technician and stationed the ED phlebotomist primarily in the RAZ area where the bulk of testing occurred. From 7 AM to 11 AM, there was 1 triage/RAZ nurse using 4 RAZ bays. Depending on RAZ volume, 2 or 3 triage/RAZ nurses functioned in this area between 11 AM to 11 PM. The triage nurse role was redefined to fit the new process, with the RAZ nurses sharing the responsibility of performing the triage assessment and initiation of orders with the technician and phlebotomist. RAZ patient flow begins with quick registration; then, patients are called by an available RAZ team member to any of the open RAZ bays. Any available

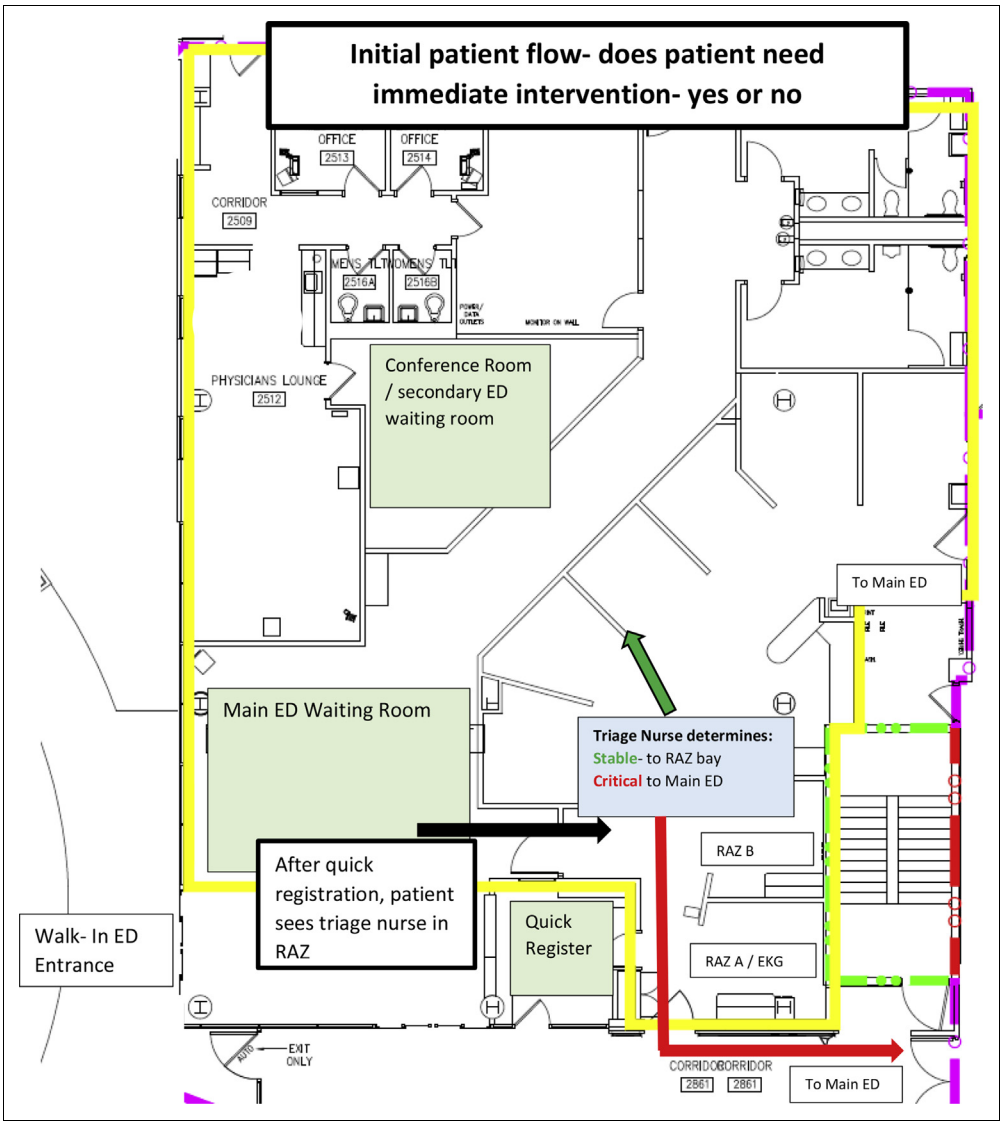

FIGURE 2

Layout of the rapid assessment zone and patient flow—initial patient flow. RAZ, rapid assessment zone; ED, emergency department; EKG, electrocardiogram.

provider (physician or advanced practice provider) could see a RAZ patient, with the provider performing the RAZ assessment being the provider of record for the entire ED visit. The RAZ process includes initial nursing triage assessment, provider assessment, order entry, phlebotomy, obtaining any other ordered specimens, medication administration, treatments, and full registration. One of the RAZ bays was dedicated to performing urgent electrocardiograms.

During the initial assessment, the provider and triage nurse would collaborate on which patients were appropriate to remain in the RAZ process and which patients would be placed in a bed in the main emergency department. After RAZ tasks (eg, blood draws) were completed, the patient was moved either back to the waiting area or to a bed in the main emergency department (Figures 2 and 3). The imaging departments picked up RAZ patients for testing from the waiting area and returned patients to the same area after testing. The goal was to have patients seen with workups started within 20 minutes of arrival to the emergency department. When there was a delay of greater than 20 minutes for provider assessment, a member of the front-end

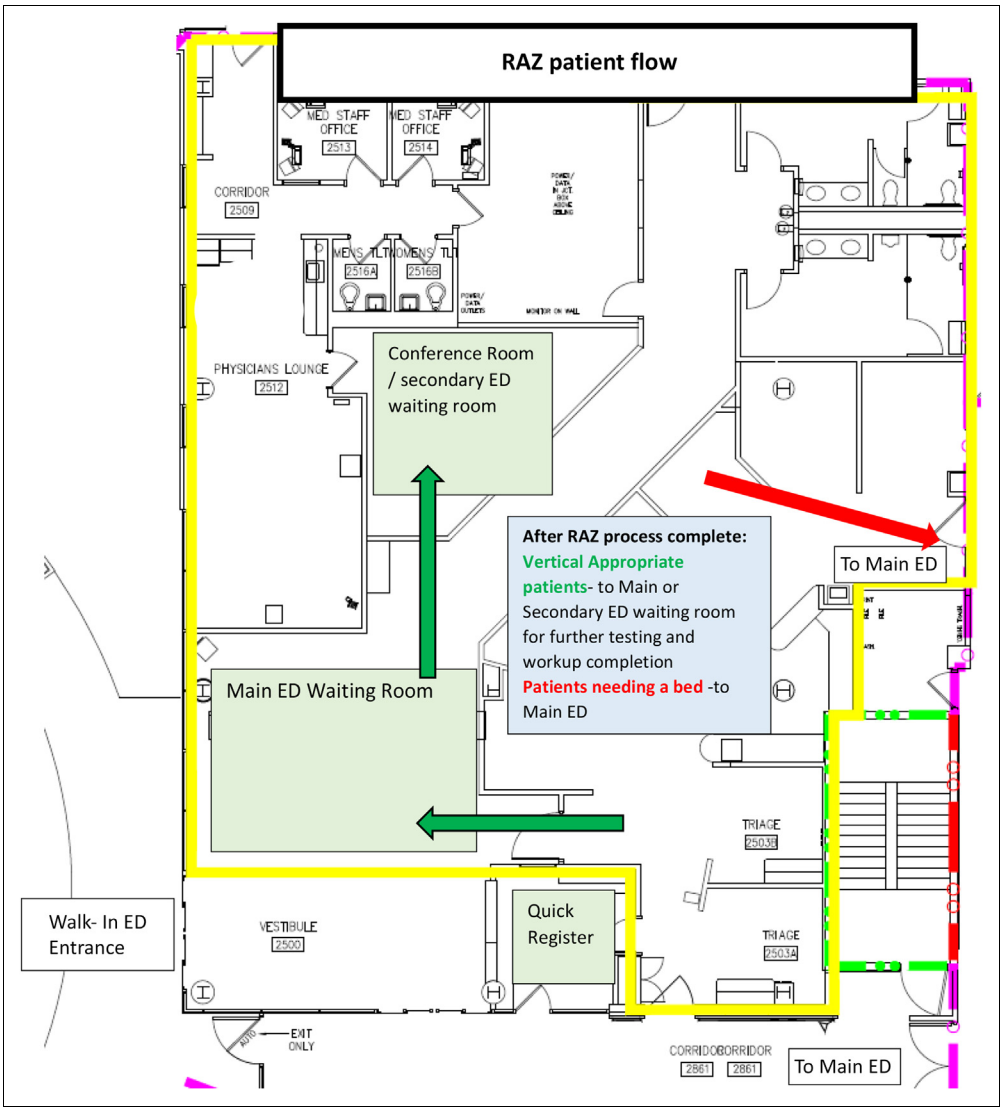

FIGURE 3

Layout of the rapid assessment zone and patient flow—rapid assessment zone patient flow. RAZ, rapid assessment zone; ED, emergency department; EKG, electrocardiogram.

team called the providers to identify a reason for the delay, and if no provider was available, one of the RAZ nurses entered protocol orders to keep RAZ flow moving. When a provider became available, the provider and the RAZ team worked to cycle patients back into the RAZ area from the waiting area for their provider assessment and enter any additional orders. In this model, critically ill walk-in or ambulance patients were directly assigned a bed in the main emergency department. Noncritical walk-in or ambulance patients were registered and proceeded through the RAZ process.

Before implementation of the RAZ process, the throughput team developed provider and emergency nursing staff education that included team role responsibilities, appropriate patient types for vertical care, vertical care orders, emphasis on concurrent provider and nurse assessment and decision making, and focus on a short RAZ LOS. In addition, staff training included elements of patient

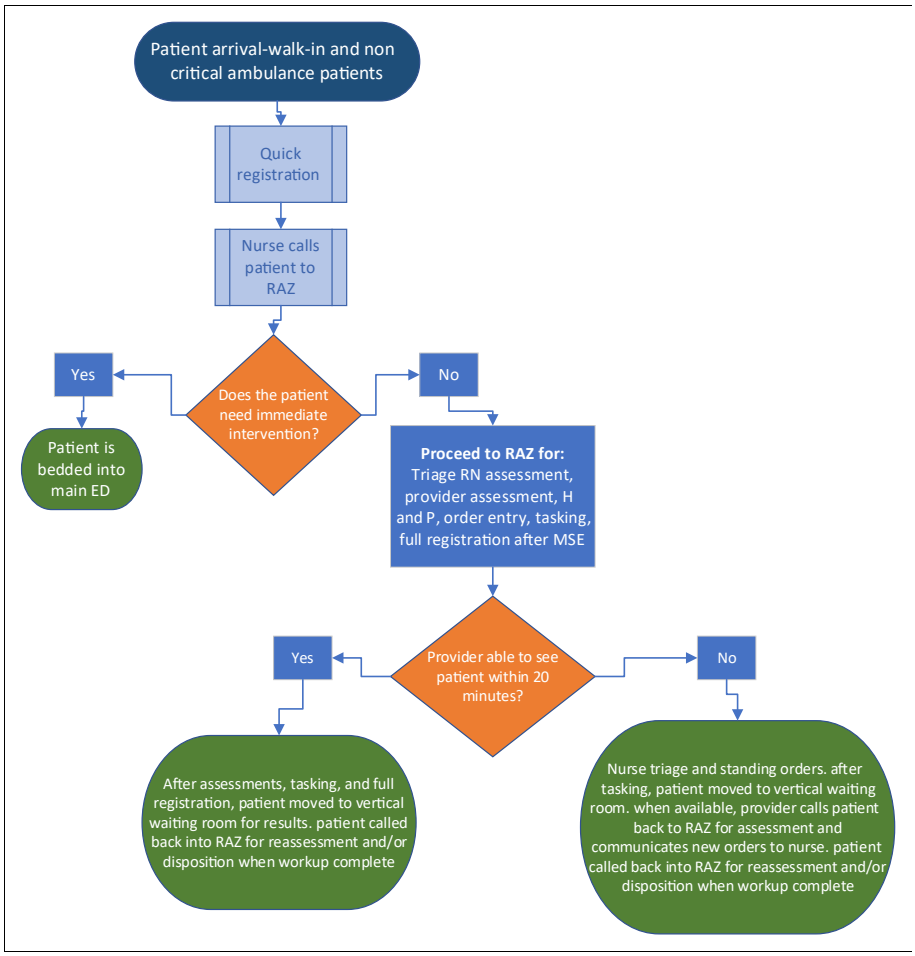

FIGURE 4

Rapid assessment zone flow diagram that was shared with staff at implementation. RAZ, rapid assessment zone; ED, emergency department; MSE, medical screening exam; RN, registered nurse.

and family education, with scripting of key words to explain the new process (Figure 3). It was essential that staff be able to articulate the benefits of the process changes to patients and their loved ones, promoting a positive patient experience. Education was conducted at staff meetings, shift huddles, and in real time on shift using the RAZ flow diagrams and scripting samples (Figure 4; Supplementary Appendix 1). A timeline of the implementation can be seen in Figure 5. During initial implementation, a member from the USACS Clinical Resource Group, a group of clinicians with over 10 years of experience in improving ED operations, was on site to support ED leadership and staff. This team member was available alongside ED leaders to help answer questions in real time and observe challenges and successes while ensuring consistency.

METHODS OF MEASUREMENT

We used data from the 6 months before and 6 months after RAZ implementation. Visit characteristics, including LWBS, arrival to provider time, and DLOS were abstracted by trained billing specialists. Briefly, the emergency department is staffed by a national group that is responsible for its own billing and coding. ED records are reviewed by billing and coding specialists who extract data from the health

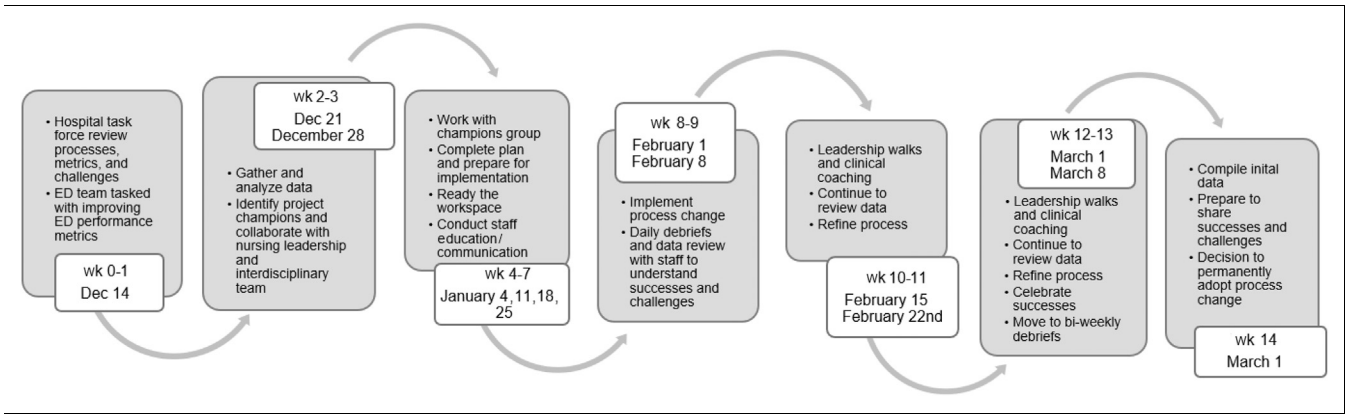

FIGURE 5

Timeline of planning and implementation. ED, emergency department; RAZ, rapid assessment zone.

records including visit characteristics (eg, disposition). All specialists undergo ongoing training, auditing, and external evaluation to ensure consistency. In addition, they are required to have or acquire relevant billing and coding certification(s). In addition to being used for billing and coding, the abstracted data are saved to a database, allowing for additional analyses that have been successfully used previously.[13]

OUTCOMES

Our primary outcome was percentage of patient visits with LWBS dispositions, defined as patients who presented to the emergency department and were registered for treatment but subsequently left before being evaluated by an ED provider.

Our secondary outcomes included arrival to provider time, defined as the length of time (in minutes) from patient arrival to initial provider evaluation; DLOS, defined as the length of time (in minutes) from patient arrival to the time the patient leaves the department upon discharge; and LOS for all ED patients and LOS for admitted ED patients (in minutes), defined as the time from ED arrival until admission.

ANALYSIS

All ED visits during the measurement period were considered for analysis. Visits where the disposition was not recorded were excluded. Time intervals less than 0 minutes or greater than the 99% percentile of times were considered spurious and interpreted as missing.[14] We summarized characteristics of ED visits using descriptive statistics. Pre- and post-RAZ implementation metrics were compared using parametric or nonparametric methods when appropriate. Normality of the data was determined by using the Shapiro-Wilk test. All analyses were completed with Stata (v. 12, College Station, TX).

Results

There were 42,390 initial ED visits during the examined time period. After removing 276 ED visits where no disposition was recorded, there were 42,115 ED visits available for analysis; 20,731 visits before implementation and 21,384 after RAZ implementation (Table 1). The majority of patients in each group were triaged as an Emergency Severity Index 3 and were discharged. All evaluated outcome metrics improved from the 6-month preintervention period to the 6-month postintervention period: LWBS (5.64% vs 2.55%; $c^2 = 258.13$; $P < .01$), median (range) of arrival to provider time (28 [8-83] vs 11 [4-27]; $P < .01$), and median (range) of DLOS (205 [133-304] vs 163 [102-243]; $P < .01$), (Table 2). These results were immediate and sustained during the studied time interval (Figures 6-8). LOS for all patients and LOS for admitted patients also decreased (Table 2; Supplementary Appendix 2).

During initial implementation, there was a higher volume of mid- to lower-acuity patients than anticipated. These mid- to lower-acuity conditions allowed these patients to remain "vertical" instead of requiring a physical bed ("horizontal") for their care. Vertical care means evaluating and treating patients without the use of a physical emergency department room when one is not necessary and assigning patients to virtual beds in the electronic health record instead of actual treatment rooms.[8] Vertical patients

TABLE 1
Pre- and postintervention visit characteristics and outcomes

Characteristics	Preintervention	Postintervention	c^2 value	*P* value
Visits	20,731	21,384		
ESI level	n (%)	n (%)		
1	233 (1.15)	159 (0.75)	530.26	<.01
2	5090 (25.13)	3444 (16.33)		
3	10,310 (50.91)	11,814 (56.02)		
4	4431 (21.88)	5491 (26.04)		
5	187 (0.92)	181 (0.86)		
Disposition	n (%)	n (%)		
AMA	208 (1)	211 (0.99)	292.44	<.01
Admitted	5473 (26.4)	5374 (25.13)		
Discharged	13,365 (64.47)	14,767 (69.06)		
LWBS	1170 (5.64)	545 (2.55)		
Other (eg, died in ED or transferred)	515 (2.48)	486 (2.27)		

ESI, Emergency Severity Index; AMA, against medical advice; ED, emergency department; LWBS, left without being seen.

are stable and can sit in a chair to receive treatments and therapies and wait for discharge. This required another emergency nurse to move from the main emergency department to the RAZ beginning at 11 AM and closing a section in the main emergency department for a total of 3 RAZ nurses. This section closure was possible, because the RAZ process successfully identified vertical appropriate patients who formerly were bedded in the main emergency department, thereby conserving the main ED rooms for higher-acuity patients, reducing back-end volume, allowing an emergency nurse to shift to the RAZ where the patient volume exists. This reallocation of nursing resources did not affect the ratios in the main emergency department and did not change the care provided to higher-acuity patients who required critical care, admission, or transfer. This was achieved without hiring additional staff or increasing provider hours.

Discussion

ED crowding and throughput are critical issues, as prolonged wait times can jeopardize quality of care and patient safety.[15] In our single-site emergency department, the implementation of a RAZ was associated with improvement in a number of ED metrics including LWBS rates, arrival to provider times, and DLOS. Creating a RAZ and vertical care process for appropriate patients helped to conserve

TABLE 2
Pre- and postintervention outcomes

Outcomes	Preintervention		Postintervention		c^2 or Kruskal-Wallis value	*P* value
	Point estimate or median	95% CI or IQR	Point estimate or median	95% CI or IQR		
LWBS % (95% CI)	5.64	5.33-5.97	2.55	2.34-2.77	258.13	<.01
Median arrival to provider (IQR)	28	8-83	11	4-27	3278.66	<.01
Median LOS for discharged patients (IQR)	205	133-304	163	102-243	990.51	<.01
Median LOS for admitted patients (IQR)	395	306-519	332	265-411	629.77	<.01

ED, emergency department; LOS, length of stay; CI, confidence interval; IQR, interquartile range.

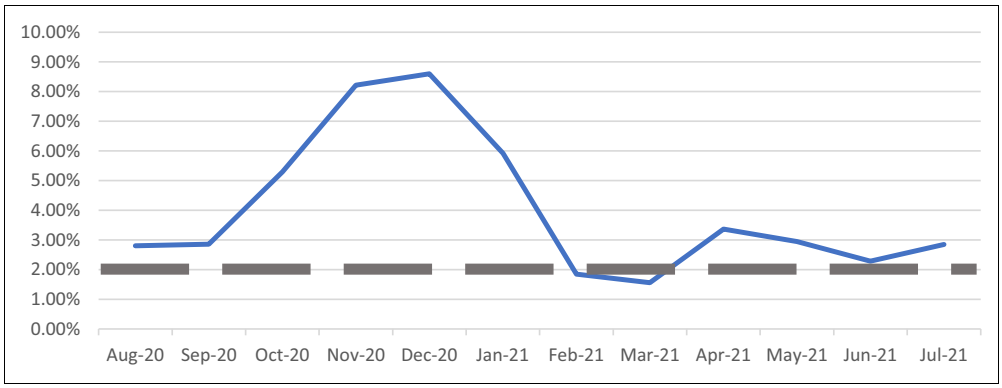

FIGURE 6

LWBS rates during the project time period. Dashed line indicates hospital goal of < 2% LWBS rates. Implementation occurred on February 1, 2021; these results show 6 months prior to implementation (August 2020-January 2021) and 6 months after implementation (February 2021-July 2021). LWBS, left without being seen.

monitored beds in the main emergency department for higher-acuity patients, which was necessary because of ED crowding. This was accomplished without the addition of staff or provider hours. Current staffing resources were used, and daily assignments were changed to redefine staff roles and shift staff to the front end, creating a RAZ and vertical care team. The RAZ model of care has been sustained through daily review of performance metrics, weekly debriefing discussions at the ED throughput team meetings, and ownership of the new process by the local ED team. ED leaders and throughput team members initially served as process champions and coaches on shift to help answer questions and address issues in real time. The team met daily during the first 2 weeks and then moved to weekly debrief discussions to discuss successes, challenges, and metrics and to make systematic alterations to the process when necessary. Consistent communication was sent to the provider and nursing teams weekly to provide status and process updates. As the RAZ process became more hardwired, debrief meetings happened every 2 weeks (Figure 3).

ED capacity and crowding contribute significantly to LWBS, and it is important to incorporate methods to keep patients moving through the department and optimize existing space to help expedite safe patient care.[16] Having a

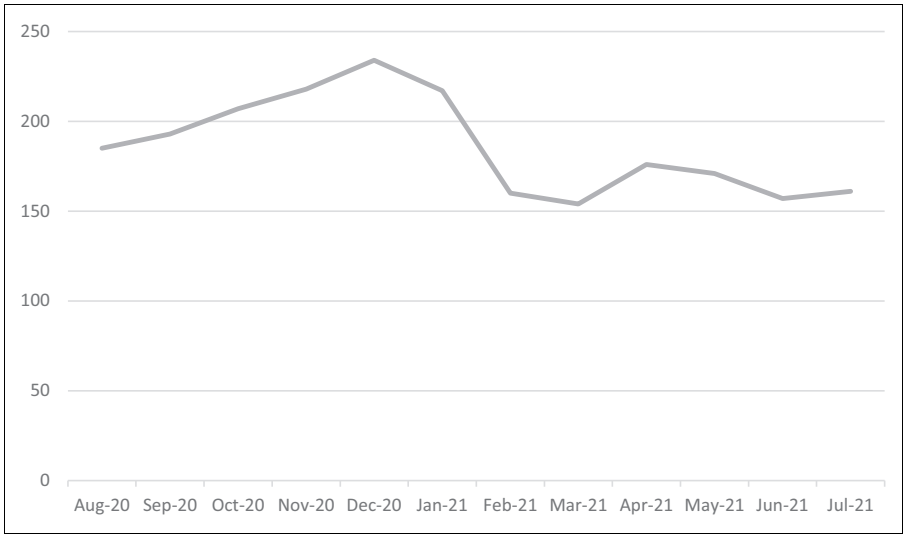

FIGURE 7

Median length of stay (in minutes) for discharged patients during the project time period. Implementation occurred on February 1, 2021; these results show 6 months prior to implementation (August 2020-January 2021) and 6 months after implementation (February 2021-July 2021).

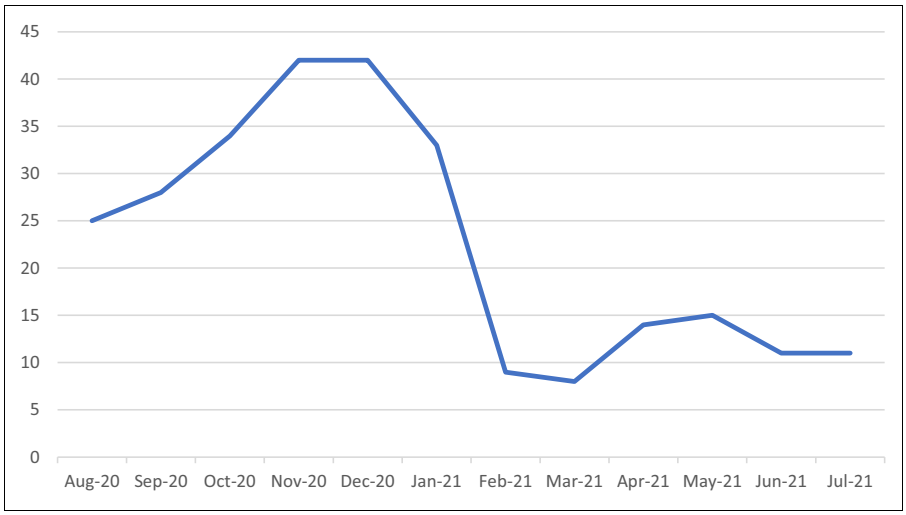

FIGURE 8

Arrival to provider times (in minutes) during the project time period. Implementation occurred on February 1, 2021; these results show 6 months prior to implementation (August 2020-January 2021) and 6 months after implementation (February 2021-July 2021).

provider assessment with orders initiated early in the visit is a key determining factor to reducing LWBS.[17] Patients experience an overall shorter LOS when cared for in a vertical model.[18] From a patient experience perspective, using key words to inform patients of the process steps, letting them know that they are moving forward in the process, and keeping them routinely informed on their plan of care also influence LWBS.[19]

Our results are consistent with those of other studies looking at the impact of RAZ on ED metrics. Anderson et al examined the impact of a RAZ in a high-volume, academic, urban emergency department and found similar results.[10] Without increasing staffing, they were able to decrease arrival to provider times, DLOS times, and LWBS rates. In addition, studies have shown that bringing additional resources to the triage area and, in appropriate patients, keeping patients "vertical" can help to decrease time in the emergency department.[7,8] ED leaders may consider a combination of these options when looking to decrease LWBS rates and improve ED throughput.

Although our results are encouraging, they should be considered in context. Improving throughput times in the emergency department requires a team approach. The RAZ and vertical care process is not a simple Provider in Triage model aimed solely at decreasing arrival to provider times but is a throughput model intended to appropriately align ED staff and resources and separate out lower-acuity vertical care patients, which has proven to be effective in decreasing arrival to provider times, DLOS, and LWBS rates.[20]

Hospital leadership should be involved in discovering the root cause of ED crowding and LWBS as optimization of the emergency department involves addressing both front-end and back-end issues (ie, boarding).[7] Multiple studies have examined other aspects associated with ED crowding and specifically focus on boarding as a key contributor.[3] Our findings should be incorporated in the context of other hospital-wide solutions to continually improve ED throughput and maximize the quality and efficiency of care delivered in the emergency department.

Limitations

Our work has several limitations. It was performed at a single community emergency department. How these results translate to other emergency departments (eg, academic facilities, larger annual volumes) is unknown. Individual efficiency variances exist between individual emergency nurses and provider clinicians. Although it was not formally measured in regard to this initiative, we anecdotally noted frequent ED boarding during the project. How RAZ implementation would affect emergency departments without boarding is unknown. We did not adjust for potential underlying differences in patient characteristics. Overall, there were improvements in our studied outcomes; however, it is unclear whether specific populations are affected differently by the RAZ. We also did not specifically account for seasonal volume and acuity variations. Data were reviewed over a 12-month timeframe, 6 months before and 6 months

after the intervention. We did not look at data over several years, and we acknowledge that there could be seasonal differences in patient populations.

Implications for Emergency Nurses

The key to our success was using an interdisciplinary team approach to process design and implementation during all phases of this process improvement initiative. A team approach has been shown to increase team ownership and sustainability of new processes. Leaders can engage staff in the Plan, Do, Check, Act Deming Cycle method of process improvement to improve team engagement during process improvement.[21] Team collaboration on process change and creation of the RAZ resulted in fewer patients LWBS, improved patient throughput, and improved ED performance metrics. Emergency nurses were key participants on the process change design team, providing valuable insights on the details of how to structure RAZ patient flow, organization of the workspace, and staff workflow. During the first 4 weeks of implementation, emergency nurses kept a daily logbook of issues that occurred, which were acted upon each day by ED leadership. Emergency nurses also participated in weekly debrief sessions outlining the challenges and successes of the week and helped to troubleshoot the identified challenges. Leveraging the expertise of emergency nurses in the process design promoted early adoption and staff ownership of the RAZ process. Creation of a vertical care model helped conserve main ED beds for higher-acuity patients, ensuring that there was increased bed availability for critical patients. Implementing a process that dedicates space and staff resources to rapid assessment and initiation of care has changed the culture of this emergency department, creating a sense of urgency to quickly care for all patients, no matter what their acuity level. Assessing patients and initiating diagnostic testing quickly has proven effective in reducing LWBS rates, arrival to provider times, and LOS.

Conclusions

The implementation of a RAZ resulted in immediate and sustained reductions in LWBS. Involving an interdisciplinary team in systematic process design and implementation was crucial to eliciting staff feedback and gaining staff buy-in for these operational changes. Team engagement is key when creating culture change and sustaining long-term process change. This approach may be used by other emergency departments to accelerate patient care and improve ED throughput.

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Author Disclosures

Conflicts of interest: none to report.

Supplementary Data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.jen.2022.10.002.

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Evaluation of Care Outcomes of Patients Receiving Hyperkalemia Treatment With Insulin in Acute Care Tertiary Hospital Emergency Department

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Contribution to Emergency Nursing Practice

- Treatment of hyperkalaemia using intravenous insulin can result in increased risk of hypoglycaemia. Regular blood glucose monitoring is not standardized.
- This article contributes the main finding that hypoglycaemic events that occurred in the Emergency Department were mostly in the first- and second-hour post hyperkalaemia treatment. Patients continued to experience hypoglycaemia up to 6 hours post treatment. A wide variation of the IV insulin and dextrose dose were used in the hyperkalaemia treatment.

Abstract

Introduction: Treatment of hyperkalemia using intravenous insulin can result in severe hypoglycemia, but regular blood glucose monitoring is not standardized. This study aimed to (i) explore the demographics of adult patients receiving hyperkalemia treatment and (ii) identify the incidence rate of hypoglycemia and associated demographic or clinical characteristics.

Methods: A descriptive design with prospective data collection was used. This study recruited 135 patients who received hyperkalemia treatment in the emergency department. Structured blood glucose monitoring was conducted at 1, 2, 4, and 6 hours after receiving intravenous insulin. Univariate analyses of association between demographic and clinical variables and hypoglycemia outcome were performed.

Results: There were 31 hypoglycemic events, with 11.9%, 7.4%, 2.2%, and 1.5% occurring at the 1, 2, 4, and 6 hours after treatment. The logit regression showed no significantly increased risk of hypoglycemia in terms of the demographic and clinical variables.

Discussion: The variation in blood glucose response observed in this study combined with the high incidences of hypolycaemia indicated the need for frequent and longer duration of monitoring for patients who were being treated for hyperkalaemia with IDT.

Key words: Hyperkalemia treatment; Blood glucose; Hypoglycemia

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Introduction

Acute hyperkalemia is a common condition in which an individual's serum potassium reading exceeds 5.0 mmol/L.[1] Patients with hyperkalemia account for as much as 1% to 10% of hospital admissions.[2] In the literature, the incidence of hyperkalemia in patients admitted into the emergency department varies between 5% and 8.8%.[3,4] If left untreated, hyperkalemia can cause electrocardiograph changes, increase the risk of cardiac arrhythmias, and potentially result in in-hospital mortality.[2,3,5] Hyperkalemia treatment usually involves a combination therapy of intravenous (IV) insulin with dextrose (IDT).[5] However, the hyperkalemia treatment may result in unwanted adverse effects, including hypoglycemia.

Hypoglycemia is defined as a blood glucose serum level lower than 4.0 mmol/L.[6] Serious health risks and morbidity increase when hypoglycemia becomes severe with blood glucose serum decreasing below 3.0 mmol/L.[7] If not detected and treated promptly, hypoglycemia can cause confusion, seizures, and loss of consciousness.[7] Under certain circumstances, untreated hypoglycemia may trigger potentially fatal cardiac arrhythmias and is associated with higher mortality and increased length of hospital stay. In a study examining the hypoglycemia rates in ED patients, 17% were classified as iatrogenic.[8] Of these reported iatrogenic hypoglycemia cases, 61% were the result of insulin administration, and the most frequent indication for treatment was for hyperkalemia. Various studies explored the incidence of iatrogenic hypoglycemia resulting from hyperkalemia treatment, and the findings revealed incident rates ranging from 6.1% to 28.8%.[2,6-16] Patients continued to experience severe hypoglycemia with reported incidence of 5.2% to 5.6.[16,17] The use of IV insulin and dextrose resulting in hypoglycemia was also shown to be correlated with an increased risk for falls among the hospitalized patients.[18] However, the recommended monitoring protocol after hyperkalemia treatment remains unspecified in the literature.[19]

BACKGROUND

Multiple patient risk factors have been identified to increase patients' risk of developing hypoglycemia after hyperkalemia treatment using IDT, including lower pretreatment blood glucose, lighter/lower weight, renal insufficiencies, older age, and not having diabetes.[19] Patients with lower pretreatment blood glucose levels were reported to be at risk of developing hypoglycemia.[6,7,13,20] Chitteni et al[8] highlighted that 38% of their iatrogenic cases in patients were caused by unrecognized malnutrition. This is especially prevalent in patients in the emergency department who are unable to eat or drink because of pre-existing medical morbidities, periprocedural fasting, or long waiting time.[20] In addition, owing to older adult patients' lack of or reduced capacity for reporting symptoms of hypoglycemia, they experienced an increased risk of hypoglycemia.[2,17] In contrast, higher pretreatment blood glucose level and type 2 diabetes diagnosis were identified to be protective factors in iatrogenic hypoglycemia after hyperkalemia treatment regimen in one study,[13] but it was found inconsistent with another recent study that reported higher baseline blood glucose level to be significantly associated with greater blood glucose reduction.[16] Researchers also have investigated other factors that could contribute to hypoglycemia after IDT, including the use of regular insulin and oral hypoglycemic agents,[20] as well as different IV regular insulin (bolus) and dextrose dosage regimen.[21-24]

Various studies have acknowledged the benefits of blood glucose monitoring (BGM) after treatment in early identification of hypoglycemia and implemented BGM regimens at varying time intervals to investigate this phenomenon. However, there is still no standardized protocol in hyperkalemia treatment and BGM after treatment, as this varies according to the preference of the treating physician and institution.[10,25] Order sets for the management of hyperkalemia with IV insulin and dextrose and routine BGM after treatment are also not a standardized treatment workflow in our current hospital setting. The risk of iatrogenic hypoglycemia resulting from IDT for hyperkalemia in the emergency department remains high, which warrants blood glucose surveillance after treatment and further evaluation.

OBJECTIVE

This study aimed to describe the demographics of adult patients who were receiving hyperkalemia treatment at the emergency department and examine the BGM regimen in relation to the outcomes of patients receiving hyperkalemia treatment, specifically, the incidence rate of hypoglycemia and the associated risk factors.

Methods

A descriptive design with prospective data collection was used in this study.

SETTING AND SAMPLE

Convenience sampling approach was adopted. All adult patients admitted to the emergency department in a local acute care hospital who received IV insulin with IV dextrose

treatment to manage hyperkalemia were recruited. The period of monitoring was from October 2020 to October 2021. The emergency department of the acute tertiary hospital caters for only adult patients in both general and critical care with a bed capacity of 84 beds with 30,000 annual visits.

Criteria for inclusion in the study were patients who presented with hyperkalemia, which is defined as a potassium serum level exceeding 5.0 to 5.5 mmol/L.[26,27] It is further subcategorized into mild (5.5-5.9 mmol/L), moderate (6.0-6.4 mmol/L), or severe (≥ 6.5 mmol/L). The exclusion criteria were pediatric patients, patients who received continuous IV insulin treatment, patients receiving IV insulin treatment for any other medical conditions and not for the treatment of hyperkalemia, and patients whose potassium results were reported and documented by laboratory staff to be hemolyzed. The current insulin treatment regimen was not standard but prescribed based on the team physician's medical decision based on the patients' condition.

INTERVENTION

Patients who were recruited into the study had their blood glucose readings monitored through scheduled capillary BGM regimen at the first, second, fourth, and sixth hours after IDT treatment. This structured BGM protocol was developed based on the best evidence from current hyperkalemia clinical guidelines.[28-30]

DATA COLLECTION

BGM and data collection were conducted by nurses working in the emergency department who were trained and briefed regarding the updated BGM protocol. The nurses identified the patients under their care who received orders for IV insulin treatment for hyperkalemia and asked for their consent to be included in the study. After patients agreed, the nurses would proceed to collect data and implement the BGM according to the updated protocol. During glucose monitoring, any of the recruited patients who had developed hypoglycemia were treated according to the institution's hypoglycemia protocol workflow. Patients with blood glucose of ≥ 2.8 to <4.0 mmol/L would be given oral dextrose 15 g in <100 mL water, and those with blood ≤2.8 mmol/L would be given oral dextrose 30 g in <100 mL water, after which blood glucose level was rechecked in 15 minutes. When blood glucose persists to be low, the physician would be notified, while the nurse administers 100 mL of IV dextrose 10% over 15 minutes and prepares IV dextrose 50% 40 mL for administration by the physician. Likewise, the medical team was informed when the patients developed hyperglycemia for further management.

Demographics and clinical information including age, sex, race, body mass index, admitting diagnosis, medical history (including diabetes and kidney disease), and concomitant use of medications that affect blood glucose levels were retrieved from the patients' electronic records. The commonly listed medications in the literature included oral antidiabetic medications, insulin, and salbutamol inhaler.[6] Hyperkalemia treatment administered including IV insulin, IV dextrose, and IV calcium gluconate as well as pretreatment and post-treatment serum potassium and capillary blood glucose measurements were recorded. The baseline blood glucose values and the BGM values measured at the first, second, fourth, and sixth hours after IDT treatment were obtained using the point-of-care blood glucose meter that was widely used by the health care professionals.[31] This would enable immediate determination of glucose levels, which was deemed sufficiently accurate. The first-line hyperkalemia treatment used in local institution is IV insulin, IV dextrose, and IV calcium gluconate. Data on other less utilized treatment including but not limited to sodium bicarbonate or sodium polystyrene sulfonate were not collected.

OUTCOMES

The primary outcome of this study was the incidence of hypoglycemia, defined as a blood glucose of <4.0 mmol/L, and severe hypoglycemia, defined as a blood glucose level of ≤ 2.8 mmol/L[6]. Secondary outcome was the determination of the associating demographic and clinical characteristics with hypoglycemia event in patients receiving hyperkalemia treatment.

ETHICAL CONSIDERATIONS

This study was approved by the Central Institutional Review Board. The study details were explained to the participants by the attending nurses who were caring for them and conducting the BGM, and verbal consent was taken.

DATA ANALYSIS

Data were entered into and analyzed using SPSS version 25.0 (IBM Corp, Armonk, NY). Descriptive statistics were used to summarize the demographic and clinical data, as well as the frequency of patients with hypoglycemia at 1, 2, 4, and 6 hours after hyperkalemia treatment. Comparison was conducted between the group that had

experienced hypoglycemia events within the 6 hours after treatment and the group that had no hypoglycemia events. For intergroup comparison, *t* test was used for continuous variables, and the chi-square test was used for dichotomous variables. Univariate analyses of the association between demographic and clinical variables and hypoglycemia outcome were performed using logistic regression. A *P* value of less than .05 was considered statistically significant. For patients with more than 1 hypoglycemia events, only the first event was included for reporting demographic results.

Results

OVERALL DEMOGRAPHIC AND CLINICAL CHARACTERISTICS

A total of 135 patients were recruited (Table 1). The mean age of the patients who received hyperkalemia treatment was 67.1 years (SD = 11.1). A total of 63.7% of these patients had kidney diseases, and 44.4% had diabetes. The treatment regimens prescribed included IV insulin 5 units to 20 units and IV 50% dextrose 20 mL to 50 mL. The main hyperkalemia treatment included the administration of 10 units IV insulin and 40 mL 50% IV dextrose (77.3%), with half of the patients receiving 10 mL IV 10% calcium gluconate (54.8%). The mean pretreatment serum potassium level was 6.1 mmol/L (SD = 0.6). Pretreatment blood glucose level was measured with a mean reading of 8.4 mmol/L (SD 4.6). The mean post-treatment serum potassium level was 5.2 mmol/L (0.7). The mean post-treatment serum potassium reduction level was −2.94 mmol/L (SD = 4.07).

HYPOGLYCEMIA EVENT UPON ADMINISTRATION OF HYPERKALEMIA TREATMENT

There were 31 hypoglycemic events, with 11.9% (blood glucose range 2.2-3.9 mmol/L), 7.4% (blood glucose range 2.6-3.9 mmol/L), 2.2% (blood glucose range 2.1-3.2 mmol/L), and 1.5% (blood glucose range 2.8-3.1 mmol/L) occurring at 1 hour, 2 hours, 4 hours, and 6 hours after receiving IV insulin. Of the 31 hypoglycemic events, 3 patients had 2 hypoglycemic events consecutively (Table 2).

Among all the 135 patients who had received hyperkalemia treatment, a total of 28 patients experienced hypoglycemia (20.7%) events (Table 3). The mean age of the patients who experienced hypoglycemia events was 65.2 years (SD = 14.5). A total of 75.0% of these patients had

TABLE 1
Patient demographics and clinical data (*n* = 135)

Demographics	n (%)
Age (y)	
≤54	25 (18.5)
55-64	35 (25.9)
65-74	34 (24.5)
≥ 75	42 (31.1)
Mean (SD)	67.1 (11.1)
Sex	
Male	67 (49.6)
Female	68 (50.4)
Race	
Chinese	98 (72.6)
Malay	22 (16.3)
Indian	15 (11.1)
Clinical parameter	
BMI, Mean (SD)	24.4 (8.1)
Past medical history*	
Diabetes	60 (44.4)
Kidney diseases†	86 (63.7)
Concomitant use of medications that affect blood glucose levels, n (%)	
Oral antidiabetic medications	31 (23.0)
Insulin	15 (11.1)
Salbutamol inhaler	2 (1.5)
Treatment regimens prescribed	
Insulin, IV (5 units) and 50% dextrose, IV (40 mL)	1 (0.7)
Insulin, IV (6 units) and 50% dextrose, IV (20 mL)	2 (1.4)
Insulin, IV (6 units) and 50% dextrose, IV (40 mL)	8 (5.9)
Insulin, IV (8 units)	1 (0.7)
Insulin, IV (8 units) and 50% dextrose, IV (20 mL)	1 (0.7)
Insulin, IV (8 units) and 50% dextrose, IV (40 mL)	16 (11.9)
Insulin, IV (10 units) and 50% dextrose, IV (40 mL)	104 (77.3)
Insulin, IV (10 units) and 50% dextrose, IV (50 mL)	1 (0.7)
Insulin, IV (20 units) and 50% dextrose, IV (40 mL)	1 (0.7)

continued

TABLE 1
Continued

Demographics	n (%)
Other treatment administered	
Calcium gluconate 10%, IV (10 mL)	74 (54.8)
Calcium gluconate 10%, IV (20 mL)	3 (2.2)
Pretreatment serum K, mmol/L	
Mean (SD)	6.1 (0.6)
Range	5.1-7.9
Mild (< 6 mmol/L)	66 (48.9)
Moderate (6.0-6.4 mmol/L)	36 (26.7)
Severe (≥ 6.5 mmol/L)	33 (24.4)
Post-treatment serum K, mmol/L	
Mean (SD)	5.2 (0.7)
Range	3.7-8.0
Mild (< 6 mmol/L)	114 (88.4)
Moderate (6.0-6.4 mmol/L)	9 (6.9)
Severe (≥ 6.5 mmol/L)	6 (4.7)

BG, blood glucose; BMI, body mass index; K, potassium; IV, intravenous.
* Denotes multiple responses in each patient.
† Includes patients with chronic kidney disease not on dialysis or on hemodialysis or peritoneal dialysis; denotes multiple responses.

kidney diseases, and 32.1% had diabetes. The main hyperkalemia treatment included the administration of 10 units IV insulin and 40 mL 50% IV dextrose (85.7%), with half of the patients receiving 10 mL IV 10% calcium gluconate (50.0%). The mean pretreatment serum potassium level was 6.1 mmol/L (SD = 0.5). Pretreatment BG level was measured with a mean reading of 6.9 mmol/L (SD = 2.7). The mean post-treatment serum potassium level was 5.0 mmol/L (0.5). There were no significant differences in the demographic and clinical parameters found between patients who experienced hypoglycemia and those who did not.

ASSOCIATION OF DEMOGRAPHIC/CLINICAL CHARACTERISTICS WITH HYPOGLYCEMIA EVENT IN PATIENTS RECEIVING HYPERKALEMIA TREATMENT

The univariate analysis showed no significant increased risk of hypoglycemia and hyperglycemia in terms of the age, sex, race, body mass index, existing diabetes and kidney diseases, pre–hyperkalemia treatment BG, and different dosages of IV insulin (Table 4). The highest odds ratios for hypoglycemia were for patients with kidney disease (odds ratio = 3.14, $P = .10$), patients who were Malay (odds ratio 1.76, $P = .66$), and those who were female (odds ratio 1.25, $P = .67$).

Discussion

This study attempted to examine the BGM regimen in relation to the outcomes of patients receiving hyperkalemia treatment, specifically, the incidence rate of hypoglycemia and the associated risk factors. Hypoglycemia is a widely recognized concern for patients receiving IDT for the treatment of hyperkalemia. Patients who were admitted into the emergency department and received the treatment for hyperkalemia in this study were mostly older, and around half were female, mirroring the participant characteristics in other studies conducted in the emergency department.[16,17] Of the patients who experienced hypoglycemia in this study, 75% had existing kidney diseases, including chronic kidney disease and end-stage renal disease. There was a trend identified in the literature demonstrating the tendency of patients with kidney diseases developing hypoglycemia compared with patients with normal renal function.[9,24,32] Some studies attributed this phenomenon to delayed or reduced capacity of insulin metabolism due to poor renal clearance.[7,9] However, there are also conflicting findings from other studies that reported that impaired renal function does not impact hypoglycemia risk from IDT.[2,15,17] It also was suggested that patients with acute kidney injury may offset hypoglycemia risk from reduced insulin clearance due to increase proinflammatory cytokines

TABLE 2
Blood glucose monitoring during the 1, 2, 4, and 6 hours after receiving intravenous insulin ($n = 135$)

Time interval	1 h	2 h	4 h	6 h
	Number of patients with ≥ 1 hypoglycemic events = 28			
Number of hypoglycemic events*, n (%)	16 (11.9)	10 (7.4)	3 (2.2)	2 (1.5)
Blood glucose, mmol/L, range	2.2-3.9	2.6-3.9	2.1-3.2	2.8-3.1

* Of the 31 hypoglycemic events, 3 patients had 2 hypoglycemic events consecutively, and all hypoglycemic events were treated according to the institution's hypoglycemia protocol workflow.

TABLE 3
Demographics of patients treated for hyperkalemia who experienced hypoglycemia events within 6 hours (n = 135)

Parameter	BG < 4 mmol/L* (n = 28, 20.7%)	BG ≥ 4 mmol/L (n = 107, 79.3%)	χ^2	*P* value
Age, y, n (%)				
≤ 54	6 (21.4)	19 (17.8)		
55-64	9 (32.1)	26 (23.3)		
65-74	6 (21.4)	28 (26.2)		
≥ 75	7 (25.1)	35 (32.7)		
Mean (SD)	65.2 (14.5)	67.6 (15.7)	−0.72†	.47
Sex, n (%)				
Male	13 (46.4)	53 (49.5)	0.02	.90
Female	14 (53.6)	54 (50.5)		
Race, n (%)				
Chinese	20 (71.4)	78 (72.9)	1.08	.58
Malay	6 (21.4)	16 (15.0)		
Indian	2 (7.2)	13 (12.1)		
BMI, Mean (SD)	23.5 (7.1)	24.7 (8.3)	−0.66†	.51
Medical history‡, n (%)				
Diabetes	9 (32.1)	51 (47.7)	2.17	.14
Kidney disease§	21 (75.0)	65 (60.7)	1.95	.16
Concomitant use of medications‡,¶, n (%)				
Oral antidiabetic medications	3 (10.7)	28 (26.2)	3.00	.08
Insulin	4 (14.3)	20 (18.7)	0.36	.55
Salbutamol inhaler	1 (3.6)	4 (3.7)	4.85	.43
Administration of treatment				
Treatment regimens prescribed, n (%)				
Insulin, IV (5 units) and 50% dextrose, IV (40 mL)	-	1 (1.0)	1.83	.77
Insulin, IV (6 units) and 50% dextrose, IV (20 mL)	2 (7.1)	1 (1.0)		
Insulin, IV (6 units) and 50% dextrose, IV (40 mL)	-	7 (5.2)		
Insulin, IV (8 units)	1 (3.6)	-		
Insulin, IV (8 units) and 50% dextrose, IV (20 mL)	-	1 (1.0)		
Insulin, IV (8 units) and 50% dextrose, IV (40 mL)	1 (3.6)	16 (15.0)		
Insulin, IV (10 units) and 50% dextrose, IV (40 mL)	24 (85.7)	80 (74.8)		
Insulin, IV (10 units) and 50% dextrose, IV (50 mL)	-	1 (1.0)		
Insulin, IV (20 units) and 50% dextrose, IV (40 mL)	-	1 (1.0)		
Other treatment administered				

continued

TABLE 3
Continued

Parameter	BG < 4 mmol/L* (*n* = 28, 20.7%)	BG ≥ 4 mmol/L (*n* = 107, 79.3%)	χ^2	*P* value
Calcium gluconate 10%, IV (10 mL)	14 (50.0)	60 (56.1)	0.54	.76
Calcium gluconate 10%, IV (20 mL)	1 (3.6)	2 (1.9)		
Pretreatment serum K, mmol/L				
Mean (SD)	6.1 (0.5)	6.1 (0.6)	−0.27†	.78
Range	5.1-7.2	5.1-7.9		
Pretreatment BG, mmol/L				
Mean (SD)	6.9 (2.7)	8.8 (5.2)	−1.79†	.08
Range	4.1-12.7	4.0-30.8		
Post-treatment serum K, mmol/L				
Mean (SD)	5.0 (0.5)	5.2 (1.0)	−1.29†	.20
Range	4.0-6.1	3.7-8.0		

BG, blood glucose; BMI, body mass index; CKD, chronic kidney disease; K, potassium; IV, intravenous.
* Only the first hypoglycemia event of each patient was included.
† Independent 2-sample *t* test.
‡ Denotes multiple responses in each patient.
§ Includes patients with CKD not on dialysis or on hemodialysis or peritoneal dialysis.
¶ Only included if medications were taken on the day of hyperkalemia treatment.

and counterregulatory hormones.[20] However, the logit regression analysis did not show a significant risk of hypoglycemia in patients with kidney diseases, despite reporting the highest odds ratio of 3.14 ($P = .10$). Furthermore, the regression analysis showed no significant increased risk of hypoglycemia in terms of other demographic and clinical variables. This continues to highlight the challenge of identifying demographic or clinical characteristics that are useful to predict the BG changes that may occur.

The recorded incidence of hypoglycemia (20.7%) found in this study was consistent with the findings from previous studies (6.1%-28.8%).[2,6-16] The hypoglycemic events occurred mostly in the first hour after IDT, at 11.9%. The hypoglycemic events started to decline in subsequent hours (second hour 7.4%; fourth hour 2.2%; sixth hour 1.5%). In previous studies, hypoglycemia has been reported at different time intervals after IDT administration, and it is most commonly reported to occur within the first 3 hours.[9,13] The highest incidence rates occurred between the first and second hours.[9,15,20] Although rare, there have been reported incidences of iatrogenic hypoglycemia occurring during the fourth and sixth hours after treatment.[15,20] Severe hypoglycemia and hyperglycemia also were reported in a retrospective study at the first and fourth hours after IDT.[10] Findings from another study demonstrated a transient increase in the BG level during the first hour after the IDT, before it decreases in the subsequent hours.[16] The variation in BG response observed in this study combined with the high incidences of hypoglycemia indicated the need for frequent and longer duration of monitoring for patients who were being treated for hyperkalemia with IDT. Early monitoring of BG, especially within the first hour of the IDT, may not be able to detect the hypoglycemia incidents that may occur in subsequent hours.

The variations of the IV insulin and dextrose dose used were highlighted in this audit review. The treatment regimens prescribed to the patients in this study included IV insulin 5 units to 20 units and IV 50% dextrose 20 mL to 50 mL. The main hyperkalemia treatment was the regimen of 10 units IV insulin and 40 mL 50% IV dextrose. The reported mean post-treatment serum potassium level was 5.2 mmol/L (0.7), with reduction level of −2.94 mmol/L (SD = 4.07). The optimal rate of correction for serum potassium is not established in the literature, which may explain the rationale for the variation in the treatment regimens in the clinical setting.[33]

Higher IV insulin or lower IV 50% dextrose dosages were identified as significant factors related to the increased risk of developing hypoglycemia.[6] The impact of different IV regular insulin (bolus) and dextrose dosage regimen was investigated in various studies.[21-24] The literature revealed a wide variation in the treatment protocols used; a range of IV insulin dosages between 2.5 units and 20

TABLE 4
Logit regression of hypoglycemia outcome in patients receiving hyperkalemia treatment ($n = 135$)

Parameters	Hypoglycemia* ($n = 135$)	
	Odds ratio (95% CI)	*P* value
Age	1.00 (0.96-1.03)	.78
Sex		
Female	1.25 (0.44-3.56)	
Male†	1 (ref)	.67
Race		
Malay	1.76 (0.48-6.49)	
Indian	1.59 (0.27-9.49)	.66
Chinese†	1 (ref)	
BMI	0.99 (0.92-1.05)	.67
Medical history		
Diabetes		
Yes	0.69 (0.23-2.11)	.52
No†	1 (ref)	
Kidney-related conditions		
Yes	3.14 (0.80-12.37)	.10
No†	1 (ref)	
Pretreatment BG	0.91 (0.77-1.08)	.27
Administration of treatment		
Insulin, IV (5/6/8 units) and 50% dextrose, IV (20/40 mL)	0.52 (0.14-1.87)	.32
Insulin, IV (10/20 units) and 50% dextrose, IV (40/50 mL)†	1 (ref)	

BG, blood glucose; BMI, body mass index; CI, confidence interval; ref, reference.
* Only the first hypoglycemia event of each patient was included.
† Reference group.

units and varying dextrose dosages from 12.5 g to 30 g were reported.[32] It was found that 83.3% of the patients who were prescribed 25 g of IV dextrose and 10 units of IV insulin experienced episodes of hypoglycemia. In contrast, the altered regimen of IV insulin reducing from 10 to 5 units with variation of dextrose dosing from 0 g to 50 g of 50% dextrose or 25 g of 10% dextrose has shown effectiveness in lowering the risk of hypoglycemia.[21,22] The impact of different IV insulin and dextrose dosage regimen also has been investigated in other studies; however, no optimal dosages of either IV insulin or dextrose were recommended.[21-24]

A structured BGM protocol was developed and implemented in this study to monitor the trend of capillary blood glucose levels at the first, second, fourth, and sixth hours after IDT. This monitoring regimen was generated based on the best evidence from the literature. However, the true incidences of hypoglycemia may be greater than what was reported. This was a result of incomplete BGM in the patients being treated for hyperkalemia in the emergency department. The noncompliance in BGM resulting in incomplete data sets has been frequently observed in previous studies.[2,11,20] Iatrogenic hypoglycemia risk is the highest in patients who were treated in the emergency department.[6] High patient workload and fast turnover rate of patients in the emergency departments have been a major barrier in compliance to simple yet essential nursing practices such as hand hygiene.[34] Considering that most patients who are admitted for hyperkalemia are usually identified and treated in the emergency department first, this presents a potential barrier in the feasibility for establishing an effective and sustainable BGM regimen prescribed for patients who have received IDT for hyperkalemia. This calls for a need to increase the awareness of the incidence of hypoglycemia among the clinicians, as well as the necessity for standardized monitoring

in the emergency department using protocol to guide the hyperkalemia management.

Limitations

This study had its limitations. First, the baseline BG was not standardized, which may result in the variation of values. However, this study has attempted to standardize the follow-up BGM timings at first, second, fourth, and sixth hours after IDT. The source of BG measures also was standardized to capillary BG measure. This study was conducted solely at the emergency department of 1 acute care hospital, which may limit the generalizability of the findings.

Implications for Emergency Nurses

Hypoglycemia is a common complication of the IDT in the emergency department. The results of this study highlighted the importance of a standardized BGM protocol in the emergency department to manage hypoglycemia events in patients who received IDT for the treatment of hyperkalemia. It is also vital to improve the awareness of clinicians managing this group of patients, which will enable them to better adopt the practices of using standardized BGM protocol for monitoring blood glucose at frequent and regular intervals. Integrating the revised standardized BGM protocol at 1, 2, 4, and 6 hours after receiving IDT into the current practices in the emergency department can aid in early detection of hypoglycemia incidents. Standardized order sets of IV insulin and dextrose is essential for the management of hyperkalemia. According to the recent review conducted, recommendations of the optimal dosage of insulin and dextrose varied.[19] Future studies can consider conducting randomized trials to compare treatment order sets involving different IV insulin and dextrose dosages. This can aid in the standardization of the protocol for the treatment of hyperkalemia in the emergency department. Future studies will be needed to identify potential strategies to minimize the risk of developing these events.

Conclusions

Implementing a standardized BGM protocol that ensures frequent monitoring of the blood glucose is vital but most often underutilized practice toward preventing the incident of hypoglycemia. Patients who received IDT for the treatment for hyperkalemia in this study continue to experience hypoglycemia beyond the initial 1 hour of monitoring, up to 6 hours after treatment. It is vital to improve the awareness of clinicians managing this group of patients that will enable them to better utilize the standardized BGM protocol to prevent incidents of hypoglycemia. Current unstandardized BGM regimen in the emergency department may be insufficient to detect patients who experience abnormal blood glucose increase or reduction after IDT. The findings of this study highlight the necessity for a standardized BGM protocol for frequent and longer duration of monitoring.

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Author Disclosures

Conflicts of interest none to report.

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Illuminating Emergency Nurses' Perceptions of Stigma, Attribution, and Caring Behaviors Toward People With Mental Illness Through the Lens of Individualized Care: A Cross-sectional Study

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Contribution to Emergency Nursing Practice

- Emergency nurses' negative attitudes and lack of caring have been identified as contributing factors to the care disparities and inequities experienced by individuals with mental illness.
- The major finding of this study is that emergency nurses' perception of individualized care toward people with mental illness is largely associated with their caring behaviors.
- Recommendations for translating the findings into emergency clinical practice include (1) designing mental health training that prioritizes caring and individualized care as core competencies for emergency nurses and (2) allocating financial and human resources to create a culture and environment where emergency nurses are supported in their work to deliver safe, quality, and individualized care for the well-being of all people.

Abstract

Introduction: Emergency nurses' negative attitudes and lack of caring have been identified as factors affecting the experience of individuals with mental illness in emergency departments. This study examined the relationships between emergency nurses' perceptions of stigma, attribution, caring behaviors, and individualized care toward people with mental illness.

Methods: A cross-sectional study was conducted among 813 nurses working in United States emergency departments. Data were collected using a demographic questionnaire; the Mental Illness: Clinicians' Attitudes Scale-4; the Attribution Questionnaire; 24-Item Caring Behaviors Inventory; and the Individualized Care Scale-Nurse version. Data analyses consisted of descriptive and correlation statistics and multiple linear regression.

Results: The findings from the final regression analysis revealed that caring had a significant relationship with individualized care (version A: $\beta = 0.70$, $P < .001$; Version B: $\beta = 0.73$; $P < .001$). Stigma and attribution had significant inverse relationships with individualized care ($\beta = -0.07$, $P < .01$; $\beta = -0.06$, $P < .05$, respectively).

Discussion: The results of this study indicated that emergency nurses' perception of individualized care toward people with mental illness is mostly associated with the nurses' level of caring behaviors toward this population. Stigma and attribution had little to no effect. Findings from this study reinforce nurses' altruistic and caring qualities. The findings suggest the need for a possible paradigm shift from antistigma training to trainings that prioritize caring behaviors toward mental illness. This could ultimately improve health equity, safety, and overall outcomes for people with mental illness.

Key words: Caring behaviors; Stigma; Attribution; Individualized care; Emergency nursing; Mental illness

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Introduction

People with mental illness experience significant health disparities and inequites. It is reported that people with serious mental illness die on average 25 years earlier from treatable medical conditions as compared to the general population.[1] The emergency department is often the point of entry into the health care system for people with mental illness, particularly those experiencing crisis. From 2017 to 2019 in the United States, there were 52.9 ED visits per 1000 adults per year with a diagnosis of a mental health disorder.[2] The high prevalence of ED usage by people with mental illness is caused partially by limited resources and access to mental health services.[3-5] Nonetheless, emergency nurses experience significant and unique challenges impeding their ability to deliver quality and safe care to this population.[4]

An essential component of care quality, person-centered care, and overall health outcomes is individualized care.[6-9] Individualized care is defined as nursing care delivery that considers the patient's personal characteristics in their clinical situation, personal life situation, and preferences, while promoting their participation and decision making in care.[10] Van Servellen[11] further added that individualized nursing care translates standard nursing procedures and tasks into care that is personally designed to meet each patient's uniqueness. Growing evidence suggests that people with mental illness experience health inequities,[3-5] which are defined as systemic differences in opportunities that affect people's ability to achieve optimal health, thereby leading to avoidable and unfair health outcome disparities.[12]

Emergency nurses have identified inadequate educational preparation, lack of support, staffing and material resources, concerns of safety, the physical design of the environment, crowding, organizational culture, personal biases, stigma, and attribution as contributing barriers to delivering quality care to people with mental illness in the emergency department.[13-19] Individuals with mental illness experience extended ED lengths of stay that can be up to 4 times longer than the general population.[2] This is often exacerbated by barriers with admission to inpatient psychiatric settings and community resources.

Of great concern are the experiences of stigma reported by emergency nurses[19-21] and care recipients.[22-25] According to Link and Phelan,[26] stigma exists in power situations where there is co-occurrence of labeling, stereotyping, separation, status loss, and discrimination. Moreover, the emotional responses that shape behavior toward a person who experiences stigma is defined as attribution.[27,28] For example, when it is perceived that mental illness is caused by weakness, bad character, or free will, then endorsement of stigmatizing attitudes, discrimination, and social distance ensues.

Recipients of care with mental illness in the emergency department have described that the negative experiences in the emergency department often result in feelings of anxiety and have worsened their presenting symptoms.[22-25] These experiences also have led to self-harming behaviors and substance use to self-medicate in effort to avoid ED visits.[29] It has been predicted that the COVID-19 pandemic is contributing to and exacerbating our nation's ongoing mental health crisis.[30] As such, the effects of the COVID-19 pandemic will likely contribute to the already existing health care challenges and inequities for individuals with mental illness, particularly in the emergency department.

Extensive research has been done on the care of people with mental illness in the emergency department. However, most were undertaken in international settings and were of qualitative designs. Owing to possible cultural and structural differences, their generalizability and transferability may be limited to settings in the United States. In addition, the findings of these studies are incongruent with the caring nature of nurses in that they report emergency nurses display negative attitudes toward people with mental illness, which has resulted in harm to care recipients.[19-25]

Although the conceptualization of stigma (and attribution) has been widely used and tested, they have not been tested with emergency nurses. Moreover, despite its significance in the promotion of quality care and overall health outcomes, individualized care has yet to be researched in the context of mental illness. A careful examination of the associations between emergency nurses' perceptions of individualized care, stigma, attribution, and caring toward people with mental illness may help in the development of interventions to advance health equity and decrease health disparities for people with mental illness. Therefore, the purpose of this study was to determine the relationships between emergency nurses' perceptions of stigma, attribution, caring behaviors, and individualized care toward people with mental illness in the United States.

THEORETICAL FOUNDATION

Owing to the incongruence in the literature with the innate caring characteristics of nurses, Swanson's[31] Theory of Caring was used as a theoretical framework for this study. According to Swanson,[31] caring is "a nurturing way of relating to a valued other toward whom one feels a personal sense of commitment and responsibility"[31] (p. 162). The fundamental and universal component of quality nursing

care is caring for a person's biopsychosocial and spiritual well-being.[31] The Theory of Caring has 5 caring processes that lead to the intended outcome of client well-being: maintaining belief, knowing, being with, doing for, and enabling. The intended outcome of well-being is one that promotes dignity, respect, empowerment, and empathy for the care recipient.[31,32]

Methods

This is a cross-sectional study that conformed to the Strengthening the Reporting of Observational Studies in Epidemiology guidelines. Convenience and snowball sampling were used for recruitment. Registered nurses actively providing direct patient care in United States emergency departments who were members of the Emergency Nurses Association, the American Nurses Association, Wolter's Kluwer, and various emergency nursing social media platforms were invited to participate in the study and were given the option to share the study link with others whom they believe met the inclusion criteria. The online program G*Power 3.1 (Heinrich-Heine University, Dusseldorf, Germany) was used to determine the necessary sample size for the study with a power of 0.80, alpha of 0.05, a medium effect size, and a 2-tailed analysis, a sample size of 84 was calculated.[33] Based on this calculation, a minimum of 120 subjects were sought to be recruited to account for incomplete responses.

DATA COLLECTION

The procedure used in collecting data was approved by Adelphi University (Garden City, NY) Institutional Review Board (030421). Participants were invited to participate in the study between March 2021 and April 2021 using a Qualtrics (Qualtrics, Provo, UT) survey link. The inclusion criteria included emergency nurses older than the age of 18 years actively practicing in United States emergency departments as staff nurses (full-time and part-time). Exclusion criteria included emergency nurses who did not provide direct patient care on a weekly basis and nurses whose primary role or specialty is not emergency nursing. Psychiatric-mental health nurses working in the emergency department were excluded owing to differences in training, experiences, knowledge, and confidence with caring for individuals with mental illness. An informed consent was implied by the participants' access of the survey link to complete the survey after reading the consent document. As a compensation, participants were offered to provide their email addresses for a chance to win 1 of 4 $100 electronic gift cards.

DATA COLLECTION INSTRUMENTS

The data were collected electronically through self-report from the completion of a survey that included a demographic questionnaire; the Mental Illness: Clinicians' Attitudes (MICA v4)[34]; the Attribution Questionnaire (AQ-9)[35]; 24-Item Caring Behaviors Inventory (CBI-24)[36]; and the Individualized Care Scale (ICS)-Nurse version.[7] Permission to use the standardized instruments was obtained via written electronic communication.

The demographic questionnaire included items on age; sex; race and ethnicity; marital status; level of education; years of nursing and emergency nursing experience; region of employment; assigned shift; perception of preparedness, knowledge, confidence, and skill to care for people with mental illness; perception of ED environment's conduciveness to caring; frequency and type of in-service on caring for people with mental illness; type of hospital system (community vs health system); and availability and type of behavioral health resources within the emergency department.

MICAv4

Stigma was measured with the MICA v4.[34] It is a modification of an earlier version MICA v2.[37] The MICA v4 is a 16-item, 5-factor scale that measures attitudes toward individuals with mental illness of students or professionals in any health care setting. The 5 factors include (1) views of health and social care field and mental illness, (2) knowledge of mental illness, (3) disclosure, (4) distinguishing mental and physical health, and (5) patient care for people with mental illness. The MICA v4 has a Cronbach alpha of 0.72.[34] The MICA v4 uses a 6-point Likert scale. The scores range from 16 to 96. Higher overall scores indicate higher levels of stigmatizing attitudes toward mental illness and mental health care.

AQ-9

The AQ-9, a shortened version of the 27-item AQ, was used to measure attribution.[35,38] It consists of the 9 items: blame, anger, pity, help, dangerousness, fear, avoidance, segregation, and coercion. Using a short vignette describing an individual with schizophrenia, the AQ-9 addresses attitudes and beliefs toward mental illness, including emotional reactions and discriminatory responses. The Cronbach alpha for the AQ-9 was reported to be between 0.62 and 0.82 in a

study by Corrigan et al.[39] The AQ-9 has 9-point Likert scale responses ranging from 1 (none at all) to 9 (very much). The scores range from 9 to 81. Higher scores represent greater perceptions of attribution, meaning the emotional response that shapes behavior toward a person with mental illness.

CBI-24

Caring behaviors was measured using the CBI-24, a shortened version of the CBI.[36,40] The CBI-24 consists of 24 items and 4 factors: (1) assurance, (2) knowledge and skill, (3) respectful deference, and (4) connectedness. The CBI-24 uses a 6-point Likert scale with mean scores ranging from 1 to 6. Higher scores indicate higher perceptions of caring behaviors. The CBI-24 has a Cronbach alpha of 0.96.[36] Two items of the CBI-24 were marginally modified for this study (with permission from the original author via electronic communication). This was done to capture the potential nursing care needs of people with mental illness in the emergency department. "Knowing how to give shots, intravenous, etc" was changed to "Knowing how to provide therapeutic interventions," and "Helping to reduce the patient's pain" was changed to "Helping to reduce the patient's psychological pain/discomfort."

ICS-Nurse Version

Perceptions of individualized care were measured with the ICS-Nurse version.[7] The scale is a 2-part questionnaire with 34 items that assesses nurses' views on how they support individuality of clients through nursing activities (ICS-A-Nurse) and their views on the extent to which individuality was maintained in the nursing care provided (ICS-B-Nurse). Each part of the scale (ICS-A-Nurse and ICS-B-Nurse) is a 17-item, 5-point Likert-type scale. Each scale consists of 3 subscales: (1) clinical situation, (2) personal life situations, and (3) decisional control over care. An example item includes "I took into account their previous experiences of being in hospital." The Cronbach alphas for the ICS-A-Nurse and the ICS-B-Nurse were 0.88 and 0.90, respectively.[7] Response options range from 1 to 5, where higher scores indicate higher perceptions of individualized care.

DATA ANALYSIS

Data were analyzed in IBM SPSS version 27.0 (IBM Corp). Data were replaced in situations where values were missing less than 10% of the time. The data were placed using the linear interpolation technique when it occurred owing to missing completely at random (MCAR) and missing at random. Data that were missing not at random were minimalistically deleted to preserve as much of the case information as possible. Descriptive analyses were performed to characterize the sample. To test for the potential presence of confounders, bivariate and univariate analyses were conducted comparing each of the scores from the demographic variables to the scores of the criterion variables (ICS-Nurse). Then, multiple linear regression analyses were performed to identify significant relationships between the study variables controlling for potential confounders. In addition, Cronbach's alpha coefficients of the standardized measures used with the sample were calculated and compared with the literature for the purpose of assessing the performance of the measures with this study's sample.

MISSING DATA

Several items had some missing scores. The percentage of missing data ranged from 0.2% for the MICA v4 to 1.9% for the AQ-9 scale. The average percentage of missing data was 1%. Four participants did not provide any data. One participant responded to 14 of 17 items on one of the scales and did not respond to the AQ-9 and MICA v4. These 5 participants were excluded from the study. Of the 813 participants included in the study, 339 participants had at least 1 missing statistic that was considered MCAR. MCAR occurs when the nonresponse is a purely random sample of the complete data; addressing nonresponse is an obligation.[41] Addressing missingness data reduces bias and increases validity.[42] The missing values were replaced by the mean of the valid scores[41,42] (Supplementary Tables 1 and 2).

Results

The purpose of this study was to determine the relationships between emergency nurses' perceptions of stigma, attribution, caring behaviors, and individualized care toward people with mental illness in the United States. Demographic characteristics of the sample are presented in Table 1 and Supplementary Tables 1 and 2. A total of 813 emergency nurses participated in this study. Most participants identified as female (n = 507, 62.5%) and were between ages 30 and 40 years (n = 439, 54%). Most participants identified as Caucasian/White (n = 310, 38.1%). The highest degree obtained was Bachelor of Science in Nursing (BSN) (n = 372, 45.8%). Most participants had 2 to 5 years of nursing experience

TABLE 1
Descriptive statistics of emergency nurses' characteristics ($N = 813$)

Demographic characteristics	Frequency (n)	%
Sex		
Female	507	62.5
Male	298	36.7
Other	6	0.7
Missing	2	0.2
Age		
<30	188	23.1
31-40	439	54
41-50	142	17.5
51-60	35	4.3
61-70	8	1
≥71	1	0.1
Marital status		
Single	226	27.8
Married	433	53.3
Divorced/widowed/separated	37	4.6
Live-in partner	115	14.1
Missing	2	0.2
Ethnicity		
Hispanic	462	56.8
Non-Hispanic	301	37
Missing	50	6.2
Race		
African American	139	17.1
Asian	63	7.7
Caucasian/White	310	38.1
Native American	126	15.5
Other	16	2
Black, other than African American	84	10.3
Pacific islander	26	3.2
Mixed race	47	5.8
Missing	2	0.2
Highest level of education*		
ADN	202	24.8
BSN	372	45.8
MSN	33	4.1
PhD/DNP	27	3.3
Missing	179	22
No. of years as an RN		
<2	126	15.5
2-5	375	46.1
6-9	206	25.3
≥10	102	12.5
Missing	4	0.5
ED nursing experience (no. of years)		
<2	172	21.2
2-5	388	47.7
6-9	187	23
≥10	63	7.7
Missing	3	0.4
No. of years at current ED of employment		
<2	123	15.1
2-5	346	42.6
6-9	191	23.5
≥10	142	17.5
Missing	11	1.4
Shift worked†		
Day	414	50.9
Evening	152	18.7
Night	27	3.3
Day to evening	164	20.2
Evening to night	52	6.4
Missing	4	0.5
Board certified emergency nurse		
Yes	718	88.3
No	92	11.3
Missing	3	0.4
BH resources in ED		
BH ED	298	49
BH professionals onsite	52	6.4
BH professionals via telemedicine	318	39.1
No services available	35	4.3
Missing	10	1.2
BH training provided by employer		
Yes	721	88.7
No	72	8.9
Missing	20	2.5
BH in-services (in past 24 mo)‡		
0	74	9.1
1	281	34.6
2	327	40.2
≥3	126	15.5
Missing	5	0.6

continued

TABLE 1
Continued

continued

TABLE 1
Continued

Demographic characteristics	Frequency (n)	%
Types of BH in-services received (no. in past 24 mo)[§]		
1	428	52.6
2	168	20.7
3	103	12.7
4	56	6.9
5	17	2.1
6	31	3.8
Missing	10	1.2
ED of employment conducive to caring for individuals with mental illness		
Strongly agree	88	10.8
Agree	417	51.3
Disagree	62	7.6
Strongly disagree	29	3.6
Neither disagree nor agree	217	26.7
Feeling prepared to care for individuals with mental illness in the ED		
Strongly agree	121	14.9
Agree	450	55.4
Disagree	57	7
Strongly disagree	21	2.6
Neither disagree nor agree	163	20
Missing	1	0.1
Possessing the knowledge and skills to care for individuals with mental illness in the ED		
Strongly agree	151	18.6
Agree	444	54.6
Disagree	48	5.9
Strongly disagree	23	2.8
Neither disagree nor agree	145	17.8
Missing	2	0.2
Confidence in ability to care for individuals with mental illness		
Strongly agree	169	20.8
Agree	435	53.5
Disagree	57	7
Strongly disagree	15	1.8
Neither disagree nor agree	135	16.6
Missing	2	0.2
Employment regions		
Northeast	71	8.7
Midwest	234	28.8
South	249	30.6
West	149	18.3
Missing	110	13.5

ADN, Associate Degree in Nursing; BH, X; BSN, Bachelor of Science in Nursing; ED, emergency department; MSN, Master of Science in Nursing; PhD, Doctor of Philosophy; DNP, Doctor of Nursing Practice.

* Highest level of education: ADN, BSN, MSN, PhD, DNP.

† Day-to-evening shift, example includes 11 AM to 7 PM; evening-to-night shift, example includes 3 PM to 3 AM.

‡ Reflects the number of in-services received from employer in the last 24 months.

§ Reflects the number of various types of in-services.

(*n* = 375, 46.1%). Nearly half of the participants had 2 to 5 years of ED experience (*n* = 388, 47.7%) and worked on the day shift (*n* = 410, 50.9%). Most participants reported having received psychiatric-mental health training from their employer (*n* = 721, 88.7%). Less than half reported receiving 1 in-service (*n* = 281, 34.6%) or 2 in-services (*n* = 327; 40.2%) in the past 24 months. Most participants either answered "strongly agree" or "agree" in answering the Likert-type question about their preparation to care for people with mental illness (*n* = 121, 14.9%; *n* = 450, 55.4%, respectively). Likewise, most participants answered "strongly agree" or "agree" to having the knowledge and skills (*n* = 595, 73.2%) and confidence to care for this population in the emergency department (*n* = 604, 74.3%). Finally, most participants were employed in the Midwest and South regions of the United States (*n* = 234, 28.8%; *n* = 249, 30.6%, respectively).

DESCRIPTIVE STATISTICS AND RELIABILITY OF STANDARDIZED MEASURES

A visual display of the descriptive statistics of the study variables and the reliability of standardized measures from our study is presented in Table 2. The Cronbach alphas for the ICS-Nurse version A and B were 0.94 and 0.93, respectively. The Cronbach alpha for the CBI-24 was 0.96. Of note, this observed Cronbach's alpha is identical with that of the original version[39] of the CBI-24. Hence, it is assumed that the minor changes to the 2 items of the scale made in this study did not have a significant effect on the tool's reliability. The Cronbach alpha for the AQ-9 was 0.88. These

TABLE 2
Descriptive statistics of study variables and reliability of standardized measures in the present study

Standardized measures	Mean (SD)	Overall sum (SD)	Range	Cronbach's alpha
MICA v4*		53.4 (9.2)	16-96	0.70
AQ-9	41.9 (20)		9-81	0.88
CBI-24	4.6 (0.8)		1-6	0.96
ICS-Nurse version A	4.0 (0.6)		1-5	0.94
ICS-Nurse version B	4.0 (0.6)		1-5	0.93

MICA v4, Mental Illness: Clinicians' Attitudes Scale-4; AQ-9, Attribution Questionnaire-9; CBI-24: 24-Item Caring Behaviors Inventory; ICS, Individualized Care Scale.
* MICA v4 is reported as an overall sum.

statistics represent excellent internal consistency with respect to reliability of the scales and are comparable with those observed in the literature.[7,36,39] Finally, the Cronbach alpha for the MICA v4 was 0.70, consistent with that reported in a study by Gabbidon et al.[34]

POTENTIALLY CONFOUNDING DEMOGRAPHIC VARIABLES RELATED TO ICS-NURSE VERSIONS A AND B

Several demographic variables were found to have significant influences on emergency nurses' perceptions of individualized care, such as race (F [7, 803] = 9.6, $P < .001$), region of employment (F [4, 808] = 13.8, $P < .001$), behavioral health resources in the emergency department (F [3, 799] = 13.7, $P < .001$), sex (F [2, 807] = 4.8, $P = .009$), marital status (F [3, 806] = 15.1, $P < .001$), and shift worked (F [4, 803] = 15.2). Participants who identified as other in the race category and worked in the South and West regions of the United States and in emergency departments with a behavioral health emergency department had significantly higher mean scores on the ICS-Nurse versions A and B, which measure nurses' perceptions of their support of patient individuality through nursing specific nursing care activities and the extent to which individuality was maintained in the nursing care. Participants who identified as female, single, and divorced/separated/widowed and worked the day shift scored significantly higher on the ICS-Nurse version B. That is, they reported significantly higher perceptions of maintaining patient individuality through their nursing care.

A Spearman's rho was calculated to screen for potential confounders and to determine the correlational relationships between the demographic variables of the study and nurses' perceptions of individualized care. Age and level of education were found to have significant negative correlations with individualized care ($r = -0.18$, $P < .001$; $r = -0.19$, $P < .001$, respectively). Receiving psychiatric-mental health in-services in the past 24 months, the perception of the emergency department of employment being conducive to care, feeling prepared to deliver care, and having the knowledge, skills, and confidence to care for people with mental illness had significant strong positive relationships with individualized care (Table 3). Supplementary Appendix provides a detailed narrative of the potentially confounding demographic variables related to individualized care. Next, the results of the multiple linear regression model to test the associations of the study variables will be presented.

RELATIONSHIP BETWEEN EMERGENCY NURSES' PERCEPTIONS OF STIGMA, ATTRIBUTION, CARING BEHAVIORS, AND INDIVIDUALIZED CARE TOWARD INDIVIDUALS WITH MENTAL ILLNESS

After controlling for the confounding variables significantly related to the individualized care, significant relationships were found between (1) caring as measured by the CBI-24, (2) stigma as measured by the MICA v4, and (3) attribution as measured by the AQ-9 with respect to individualized care, using multiple linear regression analysis.

Given that the ICS-Nurse version (A and B) is a 2-part questionnaire, 2 multiple linear regression analyses were conducted. In the first, the ICS-Nurse version A was regressed using significant demographic variables and the predictor variables. In the second, the ICS-Nurse version B was regressed in an identical manner. In step 1 of each of the regression analyses, the ICS-Nurse version (A and B) was regressed using the demographic variables previously observed to be significantly related ICS-Nurse version scores in univariate and bivariate tests.

In steps 2, 3, and 4, stigma as measured by the MICA v4, attribution as measured by the AQ-9, and caring as measured by the CBI-24 scores were sequentially used as additional predictor variables of individualized care, respectively. The overall models of the 2 multiple regression analyses explained 67% and 63% of the variance associated with individualized care nurse version (A and B), respectively: F (17, 798) = 94.22, $P < .001$, $R^2 = 0.67$; and F (25, 791) = 52, $P < .001$, $R^2 = 0.63$.

CBI-24 was significantly correlated with ICS-Nurse versions A and B ($\beta = 0.70$, $P < .001$; $\beta = 0.73$; $P < .001$, respectively). That is, as the perception of caring behaviors

TABLE 3
Partially confounding demographic variables related to individualized care

Individualized care scale - nurse version	Demographic characteristics	Test	*F*	Partial η^2	*r*
Individualized care- nurse version A	Race*	ANOVA	9.6	0.08	
	Region*	ANOVA	13.8	0.06	
	BH resources*	ANOVA	13.7	0.05	
	Age*	Spearman Rho			−0.18
	Level of education*	Spearman Rho			−0.19
	PMH in-service*	Spearman Rho			0.16
	ED conducive to care*	Spearman Rho			0.49
	Feeling prepared to care for individuals with MH*	Spearman Rho			0.5
	Knowledge and skills*	Spearman Rho			0.5
	Confidence*	Spearman Rho			0.52
Individualized care - nurse version B	Sex†	ANOVA	4.8	0.01	
	Marital status*	ANOVA	15.1	0.05	
	Race*	ANOVA	3.4	0.08	
	Shift worked*	ANOVA	15.2	0.07	
	Region*	ANOVA	15.1	0.07	
	BH resources*	ANOVA	14.9	0.05	
	Age*	Spearman Rho			−0.18
	Level of education*	Spearman Rho			−0.16
	PMH in-service*	Spearman Rho			0.19
	ED conducive to care*	Spearman Rho			0.46
	Feeling prepared to care for person with MH*	Spearman Rho			0.48
	Knoweldge and skills*	Spearman Rho			0.48
	Confidence*	Spearman Rho			0.49

ANOVA, analysis of variance; BH, behavioral health; PMH, psychiatric-mental health.
* $P < .001$.
† $P < .01$.

increases, the perception of individualized care also increases. Stigma (MICA v4) was inversely significantly related to ICS-Nurse version A ($\beta = -0.07$, $P < .01$), thereby suggesting that higher perceptions of stigma were associated with lower perceptions of nurses' support of patients' individuality through nursing care delivery. Similarly, attribution (AQ9) had an inverse significant relationship with ICS-Nurse versions A and B ($\beta = -0.06$, $P < .05$). That is, higher perceptions of attribution were associated with lower perceptions of individualized care. Through comparison of their adjusted beta statistic that measures the relative strengths of the relationships, it can be concluded that a robust correlation exists between caring behaviors and individualized care, whereas stigma and attribution had very weak to nonexistent relationships to individualized care.

Discussion

This study's purpose was to determine the relationships between emergency nurses' perceptions of stigma, attribution, caring behaviors, and individualized care toward people with mental illness in the United States. To the author's knowledge, this is the first study to explore the relationships among these variables in the context of emergency nursing care of people with mental illness. This study highlighted that emergency nurses' perception of individualized care toward people with mental illness was significantly associated with their caring behaviors. Stigma and attribution had little to nonexistent association with their perceptions of caring behaviors and individualized care. Remarkably, this study did not corroborate findings from previous studies where emergency nurses' stigmatizing attitudes toward individuals with mental illness have been identified as a barrier to

caring,[19-21] thereby supporting the caring, altruistic, and ethical characteristics of nurses. Other studies have found an association between empathic tendencies and perceptions of individualized care in samples of nurses employed in internal medicine, surgery, and intensive care units in Turkey.[43,44]

The mean score of the ICS-Nurse version A and B for this sample of emergency nurses was high (mean = 4.0; standard deviation = 0.6; range 1-5). This is similar to other studies measuring nurses' perceptions of individualized care.[7,43,45] Moreover, this study discovered several demographic characteristics associated with higher perceptions of individualized care. Participants who identified as other in the race category had significantly higher perceptions of individualized care than other races. That is, they reported higher perceptions of their support of patient individuality through nursing care. This corroborates other studies where associations were found between race and attitudes toward mental illness.[46,47] However, future research is warranted to investigate this relationship.

Second, sex was found to be associated with perceptions of individualized care. This echoes an earlier finding in a study aimed at determining the associations of job satisfaction and burnout with individualized care among a sample of nurses in Turkey where Danaci and Koc[48] found that nurses identifying as female also reported higher perceptions of individualized care. Furthermore, with respect to attitudes toward mental illness, Chambers et al[49] conducted a study across 5 European countries to describe and compare registered nurses' attitudes toward mental illness and those experiencing mental health problems, and Eksteen et al,[47] specifically in the Czech Republic, also found an association between respondents identifying as female and positive attitudes toward mental illness. In South Africa, similar results were reported.[50] However, in this present study, nurses identifying as female had significantly higher perceptions of individualized care toward people with mental illness only than those identifying their sex as "other." A limitation of the aforementioned comparative studies is that dichotomous sex options (female and male) were labeled as "gender." Nevertheless, it is worthwhile to further investigate the relationship between gender identification, sex, and individualized care toward mental illness.

Another finding in this study was the association between marital status and perceptions of individualized care where participants who identified as single and divorced/separated/widowed reported significantly higher perceptions of individualized care than others. This echoes findings from a study conducted in Turkey by Avci and Yilmaz[44] where marital status had a significant relationship with perceptions of individualized care. However, in that study, nurses who were married had significantly higher perceptions of individualized care.[44] These disparities in marital status may be caused by sociocultural differences between Turkey and the United States. For example, in 2019, the Centers for Disease Control and Prevention reported that the United States' crude marriage rate was 6.1 per 1000 total population and the divorce rate 2.7 per 1000 population.[51] This is significantly different from Turkey where the marriage rate was 10.1 and the divorce rate 1.88 per 1000 population.[52]

Interestingly, participants who worked the day shift had higher perceptions of individualized care than those working the day-to-evening and evening shifts. Although not related to emergency nurses and mental illness, Danaci and Koc[48] also found higher perceptions of individualized care among nurses working the day shift in Turkey. This is significant for emergency nursing leadership, because there may be a need to assess the availability of resources, training, processes, skills mix, staffing, workload, and leadership presence on every shift in an attempt to identify and mitigate the factors that may negatively influence the care of people with mental illness presenting to the emergency department.

Compared with the Northeast region of the United States, this study found significantly higher perceptions of individualized care among nurses working in the South and West regions. This may be caused by the cultural differences across United States regions. For example, the "southern hospitality" of the people living in the South may influence their perceptions of individualized care and overall caring. Of note, the Midwest and Northeast regions of the United States had more ED visits related to mental health and substance use disorders in 2018 than the South and West regions.[3] This might explain the lower perceptions of individualized care among emergency nurses working in the Northeast region of the United States. In addition, the impact of the COVID-19 pandemic also might have influenced these differences. Although this is the first study to find differences in perceptions of individualized care across United States regions, Idvall et al[53] found differences in perceptions of individualized care among nurses working in Cyprus, Finland, Greece, Portugal, Sweden, Turkey, and the United States (Kansas) where the nurses working in the United States had higher perceptions of individualized care than other countries, thereby suggesting that regional and geographic locations (and perhaps culture) influence perceptions of individualized care toward people with mental illness.

Nurses who were employed in emergency departments with a behavioral health emergency department reported higher perceptions of individualized care. The evidence regarding the lack of onsite psychiatric services as a hindrance to caring for people with mental illness in the emergency department is comprehensive,[19,54,55] and this study supports these findings. Moreover, past studies have found that emergency nurses' perception of lack of education, knowledge, experience, and confidence with mental illness is a barrier to delivering care to people with mental illness.[14,19-21,54-59] This study echoes these results by highlighting that in-services, perceptions of being prepared, and having the knowledge, skills, and confidence to care for people with mental illness had significant positive association with perceptions of individualized care. Furthermore, nurses' perception of the emergency department being conducive to care for people with psychiatric symptoms was positively associated with perceptions of individualized care. Likewise, several studies identified the overall ED environment as a factor to caring for people with mental illness.[14,19,20,55,56,60] These findings have implications for organizational and emergency leadership to prioritize nurse training and ED resources to ensure that the environment and culture are conducive to caring for people with mental illness.

Contrary to other studies, age was found to have significant inverse associations with perceptions of individualized care.[45,48] The difference in findings could be caused by generational differences toward mental illness. For example, age has been reported as being inversely associated with negative attitudes toward mental illness.[13,50] That is, older nurses and other health care professionals have reported less negative attitudes toward mental illness compared with those who were younger. Therefore, the finding in this study that older age was associated with lower perceptions of individualized care toward mental illness warrants further research.

Similarly to age, level of education was inversely associated with individualized care. Interestingly, in this study, emergency nurses with an Associate Degree in Nursing, a Master of Science in Nursing, or doctoral degree had significantly higher perceptions of individualized care than those with a BSN degree. Contrary to the present findings, other researchers reported that level of education was positively significantly related to higher perceptions of individualized care[44,53] and that higher levels of education were associated with higher perceptions of individualized care. Of note, in comparison with this current study, the mean score of the group with the graduate degree in the study by Avci and Yilmaz[44] was comparable with that of the associate degree group of this study. Therefore, this finding suggests that, perhaps, there are characteristics specific to nurses with a BSN or within the BSN curriculum in the United States that may influence this difference. Future research is warranted to investigate whether the new American Association of Colleges of Nursing essentials for professional nursing education, which have identified person-centered care as a domain of nursing education,[6] will influence perceptions of individualized care in the next generation of future emergency nurses, particularly toward mental illness.

As mentioned earlier, this study is the first, to the author's knowledge, that has investigated perceptions of individualized care among emergency nurses and toward people with mental illness in the United States and its relationship with stigma, attribution, and caring behaviors. Replication of this study in larger and geographically diverse samples is needed to validate the findings. In addition, future research comparing ED care recipients' perceptions of individualized care with that of emergency nurses could help gain deeper understanding of the care of people with mental illness in the emergency department. Research to determine causal relationships between the significant variables of this study and longitudinal research to investigate the significant findings that emerged in this study are necessary. Finally, further research is suggested to develop standardized instruments that are geared toward measuring nurses' caring behaviors toward individuals with mental illness.

Limitations

This study has several limitations. The data collection occurred during the COVID-19 pandemic. Emergency nurses experienced emotional exhaustion, burnout, and anxiety and were found to be at risk of posttraumatic stress syndrome resulting from their work during the pandemic.[61] As such, it is possible that participant responses in this study might have been influenced by their psychological states, personal experiences with mental health issues, and their caring experiences during the pandemic. Next, the generalizability of the study to all emergency nurses in the United States is limited owing to the study design and sampling. Another limitation is the potential for response bias by overreporting of normative behaviors on the survey. Researchers have identified survey self-reports as having potential for bias.[62,63] Finally, the AQ-9 posed a limitation, because it used a vignette specific to a person (male "Harry") with schizophrenia. This could have limited the effort to analyze general attribution toward mental illness regardless of diagnosis or identified sex or gender.

TABLE 4
Application of the theory of caring to the emergency nursing care of individuals with mental illness

Theory of caring processes	Definition	Application to emergency nursing
Maintaining belief	This is the foundation of caring. It is believing and having faith that people are able to get through events and have a meaningful future. This allows the nurse to focus on physical and emotional safety.[31,32]	Although the care recipient's symptoms may not subside while in the ED, it is important to remember that recovery is possible. Maintaining belief is taking the measures to protect the person not only physically, but also emotionally. It is paying attention to the person's nonverbal cues and body language. Maintaining belief is valuing the person in care and supporting them no matter what.
Knowing	Striving to understand events that have meaning in the person's life. It is focusing on the person. This is the integration of empirical (science), aesthetic (art), personal, and ethical knowing. According to Swanson,[31,32] formal nursing education and experience with individuals with similar conditions, as well as the knowing of self-guide nurses' caring.	Knowing is having scientific knowledge about mental illness; using the art of nursing to show a person that they are cared for and valued; and ensuring that the care is ethically and morally driven. Knowing also requires having self-awareness and personal knowing of one's own potential biases, stereotypes, stigma, or negative attitudes that may influence the care. Knowing is knowing what one does not know. Knowing is engaging in self-reflective practices and seeking peer support, as needed, to promote professional and personal growth, which can influence the ability to care. Knowing is avoiding making assumptions about the person. It is making a thorough assessment of the person and ensuring that they receive quality, safe, and equitable care. Knowing is acknowledging that individuals with mental illness have reported experiences of stigma and negative attitudes in the ED. Knowing that there are limited community resources for mental health and that the ED is often the first point of entry into health care for people with mental illness. Knowing that the general ED is not an optimal setting for people with mental illness. When possible, finding a quiet area within the ED with low stimulus to create a holistically safe and supportive environment for the person. Knowing is using basic skills, such as introducing oneself to the person and explaining your role in their care. Knowing is asking the person how they prefer to be addressed. Knowing is asking the person about their pronouns. Knowing is using person-first language to center care around the person, not their disease or symptoms. Knowing is getting to know the person and what matters to them at this moment.
Being with	This involves being emotionally present with the individual being cared for. It is conveying to them that their experiences and feelings matter. Swanson[32] stresses that being with extending to physical presence also is conveying the readiness and willingness of the nurse to care for the individual. Being with is the "message conveyed to client"[32](p.162).	To a person in crisis, the ED is a chaotic place. Seen as being "cold…loud…lacking privacy…bright." A person may be fearful and anticipate a negative experience. Being with is being authentically present with the person. Sitting at the stretcher or chair side at eye level while communicating with the person conveys "being with" the person. Attentively listening to their story and providing therapeutic responses. "I'm sorry you had to (experience….); It is OK to talk to me, I am listening" conveys "being with" the person. Rounding on the person at frequent intervals also can convey emotional and physical presence and "being with" the person.

continued

TABLE 4
Continued

Theory of caring processes	Definition	Application to emergency nursing
Doing for	According to Swanson,[32] in doing for, the nurse anticipates the needs of the person and protects their dignity. The nurse does for them what they would have done for themselves if they were able to. This is not only providing physical care but also psychological care and safety.[32]	Doing for is comforting a person who is upset or in distress. Doing for is anticipating the person's needs and ensuring the person's basic needs for comfort are met. Doing for is ensuring the person is provided with food and hydration while in the ED. Doing for is offering a regular bed in lieu of a stretcher to a person who has an extended hold time in the ED. Doing for is offering a pillow and a warm blanket to the person. Doing for is offering privacy and protecting the person's dignity. Doing for is ensuring that the person's rights are protected. Doing for is advocating for the person to decrease their wait time in the ED. Doing for is being therapeutically present and ensuring that measures are in place to protect the person from physical and psychological harm (avoiding restraints). Doing for is providing the person with choices. For example, offering a choice on which arm they would like to have their blood pressure measured. Doing for is collaborating with the team to minimize the number of times the person has to repeat their story.
Enabling	Enabling is defined "as facilitating the other's passage through life transitions and unfamiliar events"[31] p. 162). This involves coaching, informing, supporting, explaining, assisting to focus on important issues, offering feedback, and validating their reality.[31] The goal of enabling is to ensure long-term well-being.[31,32]	Enabling is providing clear, short, and concise explanations of the ED processes and what is needed to care for the person. Enabling is providing rationales for all that is being done for the person and explaining the "why." For example, explaining to the person that they can anticipate being in the ED for an extended period, because the inpatient unit is at capacity and that a discharge is not expected until the following day. It is validating that the ED is not the optimal place for their well-being, but ensuring them that measures will be put in place to ensure that they receive safe, quality, individualized care while in the ED. Enabling is recognizing that the person is the expert in their care and their needs. It is displaying humility and learning from the person what has worked and what has not worked for them.

ED, emergency department.

Implications for Emergency Nurses

This study adds to the literature on the care of individuals with mental illness in United States emergency departments. It addressed a gap in the nursing literature by finding that stigma and attribution had a very weak to nonexistent association with perceptions of caring behaviors and individualized care and that caring behaviors had a significant positive relationship with perceptions of individualized care toward people with mental illness in the emergency department. This further supports Swanson's[32] Theory of Caring where the ultimate goal is to achieve patient well-being. Evidence from this study suggests a possible need for a paradigm shift from antistigma training to training that integrates caring and individualized care as core competencies with experiential learning targeted specifically for mental illness as part of emergency nursing residency programs, orientation, and ongoing in-services. This would allow new and current emergency nurses to gain the knowledge, skills, and confidence in caring for people with mental illness.

Furthermore, findings from this study suggest that the availability of behavioral health resources within the emergency department was associated with higher perceptions of caring and individualized care. Perhaps emergency departments with behavioral health resources generally have a culture where mental health is valued and where there is an appreciation for the professional knowledge and skills to support care recipients. The disparities and inequities in the care of people with mental illness can bear legal and ethical implications. Health care organizations and ED leaders should aim to create a culture that prioritizes the

care of people with mental illness by allocating financial and human resources needed to address their care.

Emergency nurse administrators can support nurses by role modeling caring behaviors, fostering a caring environment for all people, and ensuring that all shifts have adequate resources and leadership support. The author acknowledges that the ED environment is one that is often fast paced with high patient volume, high acuity, crowding, and, at times, very limited resources that influence the nurse-patient interaction. However, despite these potential barriers, it is essential that emergency nurses demonstrate caring toward people with mental illness to support their individuality and overall well-being. Table 4 outlines the 5 caring processes of Swanson's[32] Theory of Caring and provides examples of how these can be integrated in the emergency nurses' care of individuals with mental illness.

Conclusion

The health disparities that individuals with mental illness experience are significant problems, because these can ultimately lead to severe harm, including death. Addressing behaviors toward and the care that is provided to individuals with mental illness in emergency departments could advance health equity, safety, and quality and ultimately improve their health outcomes. The caring and altruistic nature of nurses was apparent in this study. Consequently, nurses must continue to embrace caring as part of the nursing profession and identity regardless of their setting of employment. This will support that all people in their care receive care that is individualized, safe, effective, equitable, respectful, and compassionate.

Data, Code, and Research Materials Availability

I declare that I have met all ethical standards related to the research and writing of this manuscript. Institutional review board approval was received from Adelphi University, Garden City, New York.

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Author Disclosures

Conflicts of interest: none to report.

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Supplementary Data

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Appendix

SUPPLEMENTARY TABLE 1
Average percent of missing data by questionnaire

Questionnaire	n	No. of items	No. of missing stats	Average % missing stats by questionnaire (missing/items*n)
Demographics	813	26	378	1.79%
CBI-24	813	24	57	0.29%
ICS-Nurse version	81	34	209	0.76%
AQ-9	813	9	136	1.86%
MICA-4	813	16	30	0.23%
Average				0.99%

SUPPLEMENTARY TABLE 2
Descriptive statistics of emergency nurses' characteristics (N = 813)

Demographic characteristics	Frequency (n)	Percentage (%)
Degree in Psychology		
No	591	72.7
Yes	216	26.6
Missing	6	0.7
Undergraduate PMH Nursing Didactic Course (number of weeks)		
< 6	216	26.6
7 to 15	473	58.2
> 15	116	14.3
Missing	8	1
Undergraduate PMH Nursing Clinical Rotation (number of weeks)		
< 6	227	27.9
7 to 15	474	58.3
> 15	102	12.5
Missing	10	1.2
Prior PMH Experience (number of years)		
< 2	187	23
2 to 5	390	48
6 to 9	185	22.8
≥ 10	47	5.8
Missing	4	0.5
Average Number of Hours Worked Weekly		
< 12	189	23.2
12 to 36	410	50.4
≥ 36	201	24.7
Missing	13	1.6
Hospital Classification		
University Hospital	269	33.1
Community Hospital	372	45.8
Other setting	4	0.5
Urgent-Care Center	108	13.3
Other ambulatory setting	60	7.4
Hospital Type		
Stand-alone	408	50.2
Health system	376	46.2
Missing	29	3.6

continued

SUPPLEMENTARY TABLE 2
Continued

Demographic characteristics	Frequency (n)	Percentage (%)
Frequency of Caring Encounters with Patients Presenting with psychiatric symptoms (in the last 5 years)		
1 to 7 per day (at least daily)	77	9.5
2 to 6 times per week (several times per week)	443	54.5
1 to 4 times per month (once per month to weekly)	288	35.4
Missing	5	0.6

Supplementary Appendix

POTENTIALLY CONFOUNDING DEMOGRAPHIC VARIABLES RELATED TO INDIVIDUALIZED CARE

Individualized Care Scale-Nurse version A

The Individualized Care Scale-Nurse version- A which measures nurses' perception of their support of patient individuality through nursing care was found to have several demographic variables with significant influences. *Race* $F(7, 803) = 9.6$, $p < .001$, *region* $F(4, 808) = 13.8$, $p < .001$, and *behavioral health resources in the ED* $F(3, 799) = 13.7$, $p < .001$.

In terms of *race*'s influence on the Individualized Care-Nurse version-A, participants who identified as *other* had a higher mean score as compared to other races ($M = 4.4$, $SD = 0.6$, $n = 16$); followed by *African Americans* ($M = 4\ .1$, $SD = 0.5$, $n = 139$); and *Caucasians* ($M = 4.0$, $SD = 0.6$, $n = 310$). Participants identifying as being of *mixed race* had the lowest mean scores ($M= 3.6$, $SD = 0.1$, $n = 47$), followed by *Black other than African American (*$M = 3.7$, $SD = 0.1$, $n = 84$). However, the Bonferroni Post hoc analysis indicated that those identified as *other* had an ICS-Nurse-A mean score more significant than *Asians* ($M = 3.7$, $SD = .6$, $n = 63$, $p = .002$); *Black other than African Americans* ($p = .001$); and *mixed race* ($n = 47$, $p < .001$).

In the *regions* category, the South and the West had the highest mean scores ($M = 4.1$, $SD = 0.6$, $n = 249$; $M = 4.1$, $SD = 0.6$, $n = 149$, respectively) as compared to the *Northeast* ($M=3.8$, $SD = .6$, $n= 71$). The Bonferroni Post hoc analysis indicated that the South and the West regions' mean scores were significantly higher than the *Northeast* ($p <. 001$; $p = .029$, respectively).

Lastly, in the category of *ED behavioral health resources*, those working in EDs with a *Behavioral health ED* reported higher perceptions of individualized care ($M = 4.1$, $SD = 0.6$, $n = 298$). Bonferroni Post hoc analysis indicated that participants who reported working in an ED that included a *behavioral health ED* had a mean score significantly higher than those with *onsite behavioral health professionals* ($M = 3.7$, $SD = .7$, $n = 52$, $p < .001$); *behavioral health telemedicine* access ($M= 3.9$, $SD = .6$, $n = 318$, $p < .001$); and those with *no services* ($M = 3.8$, $SD = .6$, $n = 35$, $p = .029$). Thereby indicating that participants with *behavioral health ED* had significantly higher mean scores than all other behavioral health ED resources and those without services.

Individualized Care Scale-Nurse version B

In comparison, the Individualized Care Scale-Nurse version- B which measured nurses' perception of maintaining patient individuality had the following significant influences: *Sex* $F(2, 807) = 4.8$, $p = .009$; *Marital status* $F(3, 806) = 15.1$, $p < .001$; *Race* $F(7, 802) = 3.4$, $p < .001$; *Shift worked* $F(4, 803) = 15.2$, $p < .001$; *region* $F(4, 807) = 15.1$, $p < .001$; and *behavioral health resources in the ED* $F(3, 798) = 14.9$, $p < .001$).

With respect to *sex,* participants identifying as *female* and *male* reported the highest mean scores ($M = 4.0$, $SD = 0.6$, $n = 506$, $n=298$, respectively). The Bonferroni Post hoc analysis indicated that the *female* group mean difference was only more significantly different than those identified as *other* ($M = 3.2$, $SD = .3$, $n = 6$, $p = .007$). Thereby indicating no significant difference between nurses identifying as female and male.

Nurses who identified as *single* or *divorced/separated/widowed (DSW)* had the higher mean scores compared to those who were *married* or had a live-in-partner (single: $M = 4.1$, $SD = 0.55$, $n = 226$; DSW: $M = 4.1$, $SD = 0.46$, $n = 37$; married: $M = 4.0$, $SD = .63$, $n = 433$; live-in-partner: $M = 3.7$, $SD = .7$, $n =114$). The Bonferroni Post hoc analysis confirmed that the mean score differences were significant ($p < .001$; $p= .004$, respectively). Thus, emergency nurses who were *single* or *DSW* had significantly higher perceptions of individualized care as compared to other marital status groups.

Nurses identifying as *other* had a higher mean score ($M = 4.5$, $SD = 0.4$, $n = 15$), followed by *African Americans* ($M = 4.1$, $SD = 0.5$, $n = 139$), and *Caucasians* ($M = 4.1$, $SD = 0.6$, $n = 310$). Likewise, participants identifying as *mixed race* had the lowest mean scores ($M = 3.6$, $SD = 0.65$, $n = 47$) followed by *Asians* ($M = 3.7$, $SD = 0.64$, $n = 63$). The Bonferroni Post hoc analysis indicated that the *other* category's mean was only significantly higher than the *Asians* ($p < .001$), *Black, other than African American* group ($M = 3.8$, $SD = .7$, $n = 84$, $p = .001$), and the *mixed race* ($p < .001$).

A significant association was found between *shift worked* and individualized care. For example, participants who worked the *day shift* and the *evening-to-night shift* had the highest perceptions of individualized care ($M = 4.1$, $SD = 0.58$, $n = 413$; $M = 4.0$, $SD = 0.55$, $n = 52$, respectively), while participants who worked *day-to-evening shift* had the lowest mean scores ($M = 3.7$, $SD = 0.67$, $n = 164$). However, the Bonferroni Post hoc analysis indicated

that *day shift* mean was only significantly higher than the *day-to-evening shift* ($p < .001$), and *evening shift* ($M = 3.9$, $SD = .6$, $n = 152$, $p < .001$); and the *evening-to-night shift* was only significantly higher than the *day-to-evening shift* ($p = .019$).

Similarly to the Individualized Care Nurse version -A, region of employment was significantly associated with individualized care. Participants who worked in the South and *West* regions had the highest mean scores ($M = 4.2$, $SD = 0.59$, $n = 248$; $M = 4.1$, $SD = 0.60$, $n = 149$, respectively); while the participants working in the *Northeast* recording the lowest mean scores ($M = 3.7$, $SD = 0.81$, $n = 71$). Based on the Bonferroni Post hoc analysis, the South region was significantly higher than the *Northeast* ($p < .001$) and the *Midwest* ($p < .021$).

Lastly, participants who reported working in EDs with a *behavioral health ED* had the highest mean scores ($M = 4.1$, $SD = 0.61$, $n = 397$), and EDs with *no services* had the lowest scores ($M = 3.7$, $SD = 0.63$, $n = 35$). The Bonferroni Post hoc analysis indicated that the *behavioral health ED* had higher mean scores than *onsite behavioral health professionals* ($n = 52$, $p < .001$), b*ehavioral health telemedicine* ($n = 318$, $p < .001$), and EDs with *no services* ($p = .001$). This finding is similar to that of Individualized Nurse Scale-Nurse version A.

A Spearman's rho was calculated to screen for potential confounders and to determine the correlational relationships between the demographic variables of the study and nurses' perceptions of individualized care. *Age* had a negative inverse relationship with Individualized Care-Nurse version A and B ($r = -.18$, $p < .001$). Likewise, *level of education* had a significant inverse relationship with Individualized Care-Nurse version - A ($r = - .19$, $p < .001$) and Individualized Care-Nurse version- B ($r = -.16$, $p < .001$). To further understand this finding, an ANOVA with Bonferroni correction was computed leading to the following results: $F(3, 630) = 11.28$, $p < .001$, Mean(sd) *associate degree in nursing* = 4.2(.67), Mean(sd) *bachelor of science in nursing* = 3.9(.63), Cohen's $d = .48$. Having p*sychiatric mental health inservices within the last 24 months* was positively associated with Individualized Care-Nurse version A and B ($r = .16$, $p < .001$; $r = .19$, $p < .001$, respectively). Lastly, nurses' perceptions of their *ED being conducive to care* for people with psychiatric symptoms (Individualized Care-Nurse version A and B ($r = .49$, $p < .001$; $r = .46$, $p < .001$, respectively); *being prepared to deliver care* (Individualized Care-Nurse version A and B: $r = .50$, $p < .001$; $r = .48$, $p < .001$, respectively), having the *knowledge and skills to deliver care* (Individualized Care-Nurse version A and B: $r = .50$, $p < .001$; $r = .48$, $p < .001$, respectively), and having the *confidence to deliver care* (Individualized Care-Nurse version A and B: $r = .52$, $p < .001$; $r = .49$, $p < .001$, respectively) had strong significant positive correlations with perceptions of individualized care.

The Effect of the Flipped Classroom Model on Teaching Clinical Practice Skills

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Contribution to Emergency Nursing Practice

- Medical errors experienced during the delivery of health care negatively affect both health workers and patients. Medical errors can occur, because of many reasons such as inadequate education.
- With this study, for the first time in the literature, the flipped classroom model was used on 5 different applications and was done with paramedic program students.
- The flipped classroom model can be used as an alternative method to the traditional system in teaching clinical practice skills.

Abstract

Introduction: No evidence was found in the literature for the use of the flipped classroom model in teaching clinical practice skills in paramedics. The study aimed to determine the effect of the flipped classroom model in teaching clinical practice skills to paramedic program students.

Methods: The study was a single-center, randomized controlled, single-blind parallel-group study. The research was carried out with a university's first-year paramedic program students in the 2021 to 2022 academic year. The students were divided into groups by stratified sampling (intervention group = 21, control group = 21). Five clinical skills practices at various times were explained to the intervention group with the flipped classroom model and to the control group with the traditional lecture method. The research data were collected with the Introductory Characteristics Information Form, Checklists, Time Tracking Form, and Students' Questionnaire for Evaluating the flipped classroom model.

Results: Although the students in the intervention group received a higher total score from all 5 clinical practice skills than the students in the control group, this difference was not statistically significant ($P > .05$). However, although the time allocated for applications in the intervention group was 40 to 75 minutes longer than in the control group, most students stated that this model successfully taught skills and theory, increased their motivation during the application, and reduced application and exam anxiety.

Discussion: The flipped classroom model can be used as an alternative method to the traditional system in teaching clinical practice skills. This innovative educational approach can be recommended as a student-centered method in clinical skills teaching.

Key words: Education; Flipped classroom; Learning strategies; Nursing; Clinical practice skills

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Introduction

Teaching clinical practice skills has a key place in the education of health professionals. These skills contribute to shaping the professional identities of the students who are the professional health workers of the future.[1] Clinical skill is a complex action that requires a critical attitude by adapting theoretical knowledge to each patient and situation based on scientific evidence.[2,3] This situation requires health professionals to be constantly aware

of developments in this field. Students should be given the opportunity to develop their knowledge and competence performance in skills education by using innovative education methods.[4]

Innovative teaching methods emphasize problem-solving, reasoning, putting theory into practice, and student-centered learning, especially for students in hands-on education such as health programs. Strategies for student-centered learning have shown themselves intensely in teamwork and case-based learning models. In conjunction with these models, the flipped classroom model (FCM) has been found to be an opportunity for students to take an active role both inside and outside the classroom, take responsibility for learning, and use information and communication technologies. The FCM has been a preferred learning method in various programs recently, and its use is increasing.[5-7]

In the FCM, students are given access to the lesson content before the classroom environment through written, audio, and video materials. At this stage, called prestudy, students are given a primary education with material depending on their learning speed. Afterward, students participate in interactive activities such as small group discussions and case scenarios to apply what they have learned.[6,8] In addition, it has been reported that FCM can improve individual inquiry, collaborative effort, social interaction, and independent learning skills.[9,10]

Before technological innovations, traditional presentation methods such as textbook reading and slide shows were used widely.[11-13] However, it has been reported that this approach causes attention deficit in students and is insufficient in developing students' clinical practice skills.[13,14] In line with these results, it is seen that the traditional education approach cannot meet the needs of students in transferring and acquiring knowledge. Depending on the use of the conventional education approach in health programs, theoretical knowledge is transferred to students in the classroom environment, and limited time is left for laboratory studies that improve their learning skills. Various activities are given to students as homework, and students are left alone with the responsibility of absorbing and consolidating knowledge. In the FCM, activities inside and outside the classroom change places.[13] In the traditional education approach, although the time spent by the teacher with the students in a classroom after the subject is taught is approximately 20 to 35 minutes, this time is 75 minutes on average in the classrooms where FCM is used.[10]

In curricula where clinical practice skills are intense, such as health programs, FCM allows students to practice more in the classroom environment. However, in a systematic review, it is recommended that more experimental studies be conducted to prove the effectiveness of FCM.[15] Considering the studies in the field of health in the literature, there is evidence for the use of FCM in medicine and nursing education. However, in these studies, the effect of this training method used on only 1 clinical practice skill (respiratory system, urinary system) was evaluated.[16,17] However, there is no evidence of its use in the paramedic program, which is one of the departments where the health personnel who make the first intervention to the patient are trained and which takes the most practice. This study aimed to determine the effect of the FCM in skills performance with paramedic students.

Methods

TRIAL DESIGN

Consolidated Standards of Reporting Trials, 2010, were followed to report the research. This research is a single-center, randomized controlled, single-blind, parallel-group study conducted in Turkey. The clinical trial registration number is NCT05402215.

ETHICAL

Before collecting the research data, permission was obtained from the local ethics committee (04.10.2021-61) and the institution where the research would be conducted. During the data collection phase, information about the research was communicated verbally and in writing to the students. Written informed consent whereby they agreed to participate in the research was obtained. The ethical principles of the Declaration of Helsinki were complied with at all stages of the study. The students were informed that the same lesson subjects would be taught in both groups. At the same time, it was assured that the data obtained would be confidential and that the lesson grades of the students who did not participate in the study would not be affected. In addition, they were informed that they could withdraw from the study at any time.

PARTICIPANTS

The research was conducted in the paramedic program at a state university in Turkey. The paramedic program, whose training period is 2 years, includes practical lessons such as Emergency Patient Care, Emergency Aid and Rescue Studies, Basic and Advanced Life Support, and Ambulance

TABLE 1
Distribution of stratified randomization variables between groups ($n = 42$)

Characteristics	Experimental group ($n = 21$) (Mean ± SD) or n (%)	Control group ($n = 21$) (Mean ± SD) or n (%)	Test value	*P*
Grade point average	2.83 ± 0.50	2.87 ± 0.46	−0.225*	.823
School they graduated from				
Health vocational high school	4 (76.2)	5 (66.7)	0.141†	.707
Other	17 (23.8)	16 (33.3)		

* Independent groups *t* test.
† Pearson's chi-square test.

Service Training Applications. Clinical practice skills are included in the content of the emergency patient care lesson. Graduates work in emergency health care units of other institutions and organizations, especially health institutions.

The data were collected within 1 year, in the Fall and Spring semesters of the 2021 to 2022 academic year. The study population consisted of 49 students who enrolled in the 2021 to 2022 academic year paramedic program, studied in the first year, and chose the lesson in which clinical practice skills were explained. Sample selection was not made in the study, and we aimed to reach the entire study population. A total of 3 students were not included in the study, because 2 students had previously taken the lesson on clinical practice skills and 1 student refused to participate in the study. For this reason, the research started with 46 students, a 93.9% representation of the study population.

RANDOMIZATION

To ensure the homogeneity of the research groups, the students were assigned to the groups by stratified randomization method. In randomization, students' grade point average and the characteristics of the school they graduated from were taken as a basis. The total score average for the grade point average and the categorical distribution for the school they graduated from were considered. In order to reduce selection bias, randomization was made by a person other than the researchers using the Excel (Microsoft) program, and 23 students were assigned to the intervention group and 23 to the control group. No statistically significant difference was found between the study groups regarding the variables used in stratified randomization (Table 1).

Two students in each group were excluded from the study during the research process because of lateral transfer and dropout. Therefore, the study was completed with 21 students in each group (Figure 1). After the data collection phase was completed, using G*power 3.1 (Franz Faul, Universität Kiel, Germany), the sample size was determined to be sufficient by finding power = 0.92 in the post hoc analysis performed with a 5% type 1 error, taking the mean scores of the clinical practice checklist as a reference.

SURVEY TOOLS

The data of the study were collected using the "Introductory Features Information Form" containing the introductory information of the students, the "Clinical Practice Skill Videos and Checklists" containing the clinical practice skill steps, the "Time Tracking Form," and the "Student's Questionnaire for Evaluating the Flipped Classroom Model."

Introductory Features Information Form

The researchers prepared the introductory characteristics information in the light of the literature to define the characteristics of the intervention and control group students.[9,10,18] The form consists of 7 questions, including the characteristics of the students' age, gender, chronic illness, grade point average, financial situation, place of residence during university education, and family type.

Clinical Practice Skill Videos and Checklists

Among the most common practices performed by health care professionals are intravenous (IV) catheterization, IV blood collection, blood pressure measurement from the brachial artery, intramuscular (IM) injection into the ventrogluteal region, and urinary catheterization in

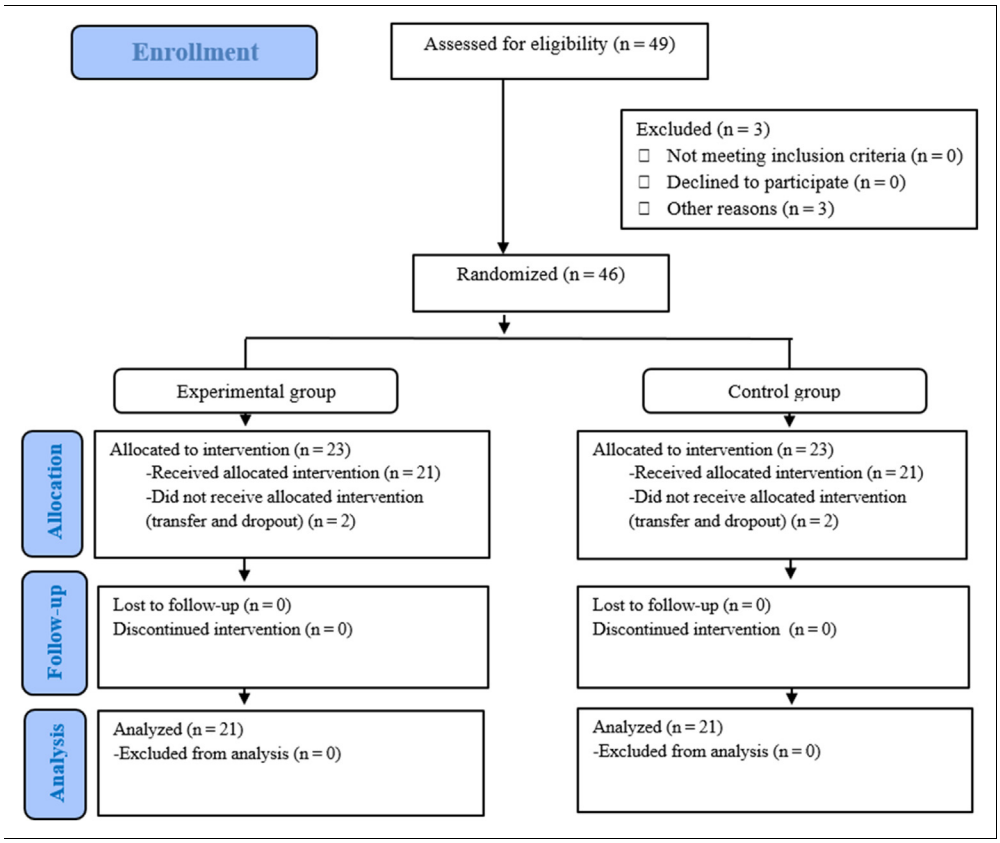

FIGURE 1

Consort flow diagram. CONSORT, Consolidated Standards of Reporting Trials.

women.[19,20] For this reason, these most frequently applied skills were preferred in the study.

Clinical Practice Skill Videos and Checklists were prepared by researchers using clinical practice guidelines and expert opinion was taken from 3 academicians in the field of nursing fundamentals.[21,22] Experts were asked to evaluate the videos and checklists. It was concluded that the videos after the evaluation could be used in the education of the students in the intervention group and that the checklists were appropriate for skill evaluation. In the study, IV catheterization (28 administration steps), IV blood collection (24 administration steps), blood pressure measurement from the brachial artery (24 administration steps), IM injection into the ventrogluteal region (34 administration steps), and female urinary catheterization (5 checklists containing skill steps of 39 application steps) were used. In the checklists, each application step was arranged in a 3-point Likert scale as "applied" (2 points), "applied incompletely" (1 point), and "did not apply" (0 points). The lowest score in the checklists was 0, and the highest score differed according to the number of skill steps in clinical applications.

Time Tracking Form

The researchers created the form to determine the time allocated for each clinical practice lesson's theoretical and practical parts in the intervention and control groups. The lecturer filled out the form after each lesson.

Student Assessment Questionnaire for the FCM

The researchers developed the questionnaire so that the students in the intervention group could evaluate the clinical practice skill process they received with FCM at the end

TABLE 2
Introductory characteristics of the students (n = 42)

Characteristics	Experimental group (n = 21) Mean ± SD or n (%)	Control group (n = 21) (Mean ± SD) or n (%)	Total (N = 42) (Mean ± SD) or n (%)	Test value	P
Age	20.09 ± 1.26	20.04 ± 086	20.07 ± 1.06	0.143*	.887
Grade point average	2.83 ± 0.50	2.87 ± 046	2.85 ± 0.48	–0.225*	.823
Gender					
Female	16 (76.2)	14 (66.7)	30 (71.4)	0.467†	.495
Male	5 (23.8)	7 (33.3)	12 (28.6)		
Chronic disease					
Yes	2 (9.5)	1 (4.8)	3 (7.1)	0.359‡	.549
No	19 (90.5)	20 (95.2)	39 (92.9)		
Place of residence during university education					
Dormitory	6 (28.6)	7 (33.3)	13 (31.0)	1.135‡	.567
House	13 (61.9)	10 (47.6)	23 (54.8)		
With family	2 (9.5)	4 (19.0)	6 (14.3)		
Financial situation					
Income less than expenses	9 (42.9)	8 (38.1)	17 (40.5)	1.059‡	.589
Income equals expense	12 (57.1)	12 (57.1)	24 (57.1)		
Income more than expenses	0 (0.0)	1 (4.8)	1 (2.4)		
Family type					
Nuclear	19 (90.5)	17 (81.0)	36 (85.7)	0.778	.378
Extended	2 (9.5)	4 (19.0)	6 (14.3)		

* Independent groups t test.
† Pearson's chi-square test.
‡ Fisher's chi-square test.

of 1 year. There were 5 questions in the survey. Survey questions were answered as "yes," "partly," or "no."

OUTCOME CRITERIA

After randomization, the "Descriptive Characteristics Information Form" was applied to determine the descriptive characteristics of the students in both groups. Checklists were filled in during the applications at various times, depending on the lesson curriculum. At the end of the 1-year period, the "Students' Evaluation Questionnaire for the Flipped Classroom Model" was applied to determine the students' thoughts on FCM. The students were given the forms and were requested to answer them.

The primary outcome was the practice skill score determined by checklists. The secondary result was the time allocated for theoretical explanation and practice teaching clinical practice skills determined by the follow-up chart. The tertiary outcome was the intervention group students' feedback on the FCM.

APPLICATION OF RESEARCH

The data of the study were collected during the COVID-19 pandemic. Therefore, the protective equipment recommended by the Ministry of Health to be used in the education process also was used in the data collection process. After the sample group was determined, a face-to-face meeting was held with the students. The applications to be made during the process were explained, and the questions the students were curious about were answered. Afterward, students were given an introductory feature information form, and they were asked to fill in the forms.

TABLE 3
Distribution of students' scores from checklists in clinical practice skills ($n = 42$)

Clinical practices	Experimental group ($n = 21$)			Control group ($n = 21$)			Test value*	*P*
	Mean ± SD	Min	Max	Mean ± SD	Min	Max		
IV catheterization	47.14 ± 3.18	39	53	45.71 ± 3.00	41	54	1.496	.142
IV blood collection	43.90 ± 2.02	40	46	42.76 ± 1.86	39	46	1.902	.064
Blood pressure measurement from the brachial artery	39.62 ± 2.87	32	44	39.61 ± 2.55	35	46	−0.284	.778
IM injection to the ventrogluteal region	51.22 ± 6.81	40	63	51.19 ± 7.36	34	62	−0.065	.948
Urinary catheterization in women	59.57 ± 7.89	46	73	59.52 ± 8.42	40	72	0.019	.985

IM, intramuscular; IV, intravenous; Max, maximum; Min, minimum.
* Independent groups *t* test.

While FCM was used in teaching clinical practice skills to students in the intervention group, the traditional lecture method was used in the control group. Each clinical skills practice was made in the weeks determined according to the lesson curriculum. The videos that the researchers had previously prepared for clinical skills practices were shared with the intervention group students 1 week before each clinical skills practice lesson day for prestudy purposes, and the students were asked to work on these videos. On the day of the lesson, the researcher (instructor conducting the lesson) conducted group work, question-answer, and discussion activities with the students in the classroom environment. The clinical skills practices were explained to the students in the control group by the researcher (instructor conducting the lesson) using presentation and demonstration methods. In the intervention and control groups, time was kept by the researcher to determine the time allocated for the theoretical and practical parts of each clinical practice lesson. At the end of each clinical skills practice lesson, students in both groups were asked to apply clinical skills practice on simulation models of the application.

While the students were completing the clinical skills practices, one of the researchers observed the clinical skills practices and marked only the skill level in the checklists ("applied," "incompletely applied," and "did not apply") without any comment or direction. The checklists were filled by another researcher who did not know which group the students belonged to in order to reduce the risk of bias.

EVALUATION OF DATA

The statistical package program evaluated the data obtained from the research in the computer environment SPSS Statistics 23.0 (IBM Corp, Armonk, NY). The normal distribution of numerical data was examined with the Shapiro-Wilk test of normality. Descriptive data were shown as numbers, percentages, and averages. Comparisons of numerical data between groups were made with an independent sample *t* test, and comparisons of categorical data were made with Fisher's or Pearson's chi-square analysis according to distribution. The comparison of the scores obtained from the checklists between groups was made with the independent sample *t* test. In all comparisons, the results were evaluated with a 95% confidence interval, and $P < .05$ was considered significant.

Results

A total of 42 students participated in this study. Table 2 shows the introductory characteristics of the students in the intervention and control groups. The students in the intervention and control groups did not have any statistically significant differences in age ($P = .89$), grade point average ($P = .82$), gender ($P = .50$), chronic illness ($P = .55$), place of residence during university education ($P = .57$), financial situation ($P = .59$), and family type

TABLE 4
Distribution of the time allocated to theoretical explanation and practice according to the groups ($n = 42$)

Clinical practices	Experimental group ($n = 21$)		Control group ($n = 21$)	
	Time used for theoretical lecture	Time used for practice lecture	Time used for theoretical lecture	Time used for practice lecture
IV catheterization	25	135	80	80
IV blood collection	20	140	80	80
Blood pressure measurement from the brachial artery	55	105	120	40
IM injection to the ventrogluteal region	25	135	90	70
Urinary catheterization in women	50	110	120	40

IM, intramuscular; IV, intravenous.

($P = .38$). These results show that the 2 groups are homogeneous regarding introductory characteristics.

The distribution of the scores obtained by the students from the checklists applied during their clinical practice skills is given in Table 3. IV catheterization ($P = .14$), IV blood collection ($P = .21$), blood pressure measurement from the brachial artery ($P = .78$), IM injection to the ventrogluteal region ($P = .95$), and urinary catheterization in women ($P = .99$) of the students in the intervention and control groups were found to have similar total scores from practice skills and no statistically significant difference.

Table 4 shows the distribution of the time allocated to theoretical explanation and practice teaching clinical practice skills according to the intervention and control groups. In the intervention group, the time allotted for practice after the lecture was 135 minutes for IV catheterization, 140 minutes for IV blood collection, 105 minutes for blood pressure measurement from the brachial artery, 135 minutes for IM injection into the ventrogluteal region and urinary tract in women, and 110 minutes for catheterization. In the control group, it was determined that the time allocated for the application was lower in all 5 clinical applications.

Table 5 shows the distribution of the students' views on FCM in the intervention group. A total of 90.5% of the students stated that FCM's clinical practice skills were successful in teaching skills, 95.2% of them said that FCM was successful in the theoretical teaching of clinical applications, 66.7% of them stated that FCM reduced the anxiety experienced during laboratory application, 76.2% said that FCM increased your motivation for the clinical practice skills lesson, and 52.4% of them stated that FCM's clinical practice skills lesson reduced test anxiety.

Discussion

Health services are the priority of all countries. However, medical errors experienced during the provision of the service negatively affect both health care professionals and patients. Medical errors can occur because of many reasons. The leading causes of medical errors are grouped under 3 headings: institutional factors, technical factors, and human-related factors such as lack of communication, lack of time, wrong decision, and insufficient education.[23] One of the ways to prevent these mistakes is to ensure that students thoroughly learn the practices in the education process and have the equipment to apply them in their professional life. For this, it is recommended to use innovative training methods.[10,24]

The data obtained from this study, which was conducted to determine the effect of FCM on students' learning clinical practice skills compared with the traditional teaching method, were compared with the literature.

Although the total score average of the students in the intervention group in the skills of IV catheterization, IV blood collection, blood pressure measurement from the brachial artery, IM injection to the ventrogluteal region, and urinary catheterization in women was higher than that of students in the control group, there was no statistically significant difference between the groups ($P > .05$; Table 3). There are studies with comparable results in the literature. Similarly, in a study conducted on nurses using FCM, it was found that there was no significant difference between the 2 different teaching methods.[25] There are also studies demonstrating the effectiveness of the FCM on clinical skills. In their study, Aksoy and Gurdogan[17] demonstrated that FCM effectively improves urinary system

TABLE 5
Distribution of the students in the intervention group about FCM ($n = 21$)

Questions about FCM	Yes n (%)	Partially n (%)	No n (%)
Do you think FCM is successful in teaching skills of clinical applications?	19 (90.5)	1 (4.8)	1 (4.8)
Do you think that FCM is successful in the theoretical teaching of clinical applications?	20 (95.2)	0 (0.0)	1 (4.8)
Do you think that FCM reduces the anxiety you experience during laboratory practice?	14 (66.7)	5 (23.8)	2 (9.5)
Do you think that FCM increases your motivation for the clinical practice skills lesson?	16 (76.2)	4 (19.0)	1 (4.8)
Do you think that FCM's clinical practice skills lesson reduces test anxiety?	11 (52.4)	6 (28.6)	4 (19.0)

FCM, flipped classroom model.

knowledge and skills. In studies conducted with the FCM in the surgical field and on drug applications, it was found that the model significantly affected theoretical knowledge and clinical practice skills.[26,27] As a result, when the data obtained from the study are compared with similar studies in the literature, it is thought that FCM can be used in teaching clinical practice skills.

Studies show that FCM allows teachers to devote more time to their students to explore the practice during the lesson.[18,24,28] Students need support and time to transfer the knowledge they have learned to practice during the lesson. Our study determined that the time allocated for the application was higher in the intervention group than in the control group (Table 4). However, the fact that the students in the intervention group practiced longer than the control group was not statistically significant in terms of their total score averages from clinical practice skills. This may be, because students are evaluated in their first laboratory practice. In other words, in our study, an average of 5.95 minutes was allocated to each student in the intervention group in the first application. During this time, they were both given the opportunity to practice and evaluated according to the checklists. The students in the control group were asked to practice for an average of 2.95 minutes, and the checklists were filled out. Therefore, it is thought that there is no statistical difference in terms of clinical practice skills, but the time allocated to the practices in the groups may be effective in the success of the students.

Students in the intervention group stated that FCM successfully taught skills and theory of clinical practices, reduced anxiety experienced during laboratory practice, increased motivation for practices, and decreased anxiety about clinical practice skills exams (Table 5). In the literature, it has been shown that FCM increases students' participation in the lesson, their interaction with teachers and peers, and their attention span, and provides opportunities to receive simultaneous feedback.[29] In another study, it was stated that statistically significant findings could not be reached, but students saw FCM as an acceptable approach.[16] In line with the answers given by the students in the intervention group about FCM, it was concluded that this innovative approach is an effective method on teaching clinical practice skills.

The COVID-19 pandemic has led to the cessation of face-to-face education in institutions and the start of digital developments in education.[30-32] Various international organizations have recommended using distance education programs and open access platforms to reduce disruption to the learning process.[33] In a study investigating the effect of FCM in online education, it was stated that the model was effective in learning.[34] In line with the information obtained from these research findings and the literature, it is thought that FCM can be preferred by educators in both face-to-face and online education.

Strengths and Limitations

There is limited information in the literature on the use of FCM in the curriculum of health programs. The study's strengths are that the model is made for 5 different applications and that it is the first study in the literature on its use in paramedic program. However, the study also has some limitations. The research was conducted in a single institution with a small number of sample groups. The study focused only on the difference between FCM and traditional teaching methods rather than multiple learning approaches. Therefore, it cannot be generalized to all students in the health program where clinical practice skills are taught.

Implications for Emergency Nurses

It is vital that the applications are carried out effectively in emergency services and in the prehospital area. Nurses and paramedics working in these areas need to receive well-equipped training. Therefore, innovative approaches have an important place in the process of learning clinical practice skills of paramedic program students.

With this study, for the first time in the literature, the FCM was made on 5 different applications and was used on paramedic program students. It has been proven that the FCM can be used as an alternative method to the traditional system in teaching clinical practice skills.

Conclusion

The total scores of the students in the intervention group for IV catheterization, IV blood collection, measuring blood pressure from the brachial artery, IM injection to the ventrogluteal region, and applying urinary catheterization in women, and the time allocated for the application were higher than those in the control group. The students in the intervention group stated that FCM successfully taught skills and theory of clinical practices, reduced the anxiety experienced during laboratory practice, increased the motivation for the practices, and decreased the concern about the clinical practice skill exam. These results support that FCM can be used in teaching clinical practice skills.

The FCM is used in this example to teach clinical skills but also can be used to teach didactic or conceptual knowledge. For example, it also can be used in the teaching of other clinical practice skills such as shock, triage, and head injury. In addition, it is recommended to evaluate the long-term effects of the model and compare it with other training models in future studies.

Data, Code, and Research Materials Availability

Clinical Trial Registration Number: NCT05402215. Clinical Trial Registration Name: The Effect of the Flipped Classroom Model on Teaching Clinical Practice Skills registration link: https://clinicaltrials.gov/ct2/show/NCT05402215?term=Ali+KAPLAN&draw=2&rank=3.

Author Disclosures

Conflicts of interest none to report.

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A Single-Center Prospective Study of the Effects of Different Methods of Phlebotomy in the Emergency Department on Blood Sample Hemolysis Rates

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Contribution to Emergency Nursing Practice

- Blood sample hemolysis causes re-collection of blood samples and prolongs the length of stay of patients in the emergency department.
- The use of 20 gauge intravenous catheter and Luer-Lock access device is effective in reducing blood sample hemolysis when blood is drawn from the intravenous catheter.
- Using a steel straight needle is best practice to reduce blood sample hemolysis, but if not possible, use of Luer-Lock access device and a larger bore intravenous catheter is better than a smaller one. This should lead to fewer delays in treatment and discharge.

Abstract

Introduction: Hemolysis is more commonly seen in the emergency department and causes delays in diagnosis, hospitalization, discharge, and treatment of patients. The aim of this study was to determine the most appropriate phlebotomy method and device to reduce blood sample hemolysis in the emergency department.

Methods: This prospective, comparative descriptive study involved patients who presented to the emergency department with any medical condition and required blood sampling. Patients were divided into 6 groups according to the method of phlebotomy and the device used for phlebotomy. Data were analyzed with logistic regression.

Results: A total of 715 patients participated in the study. The blood sample hemolysis rate in the emergency department was 25.7%. When the hemolysis rates were compared with a steel straight needle or intravenous catheter, it was found that the use of steel straight needle significantly reduced hemolysis. Blood drawing through a 20 G intravenous catheter with Luer-Lock access device reduces the risk of hemolysis. Male sex and difficult blood collection also have been shown to increase the risk of hemolysis.

Discussion: Blood should be drawn with a steel straight needle instead of an intravenous catheter. However, when that is not possible, we recommend the use of a 20 G intravenous catheter with Luer-Lock access device if a blood sample is to be drawn from intravenous line.

Key words: Emergency department; Hemolysis; Phlebotomy

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Introduction

Most factors that cause erroneous laboratory test results occur in the preanalytical phase.[1] Hemolysis is the major cause of preanalytical errors.[2] Hemolysis is more commonly observed in emergency department specimens than in other hospital departments, and 10% to 30% of emergency department specimens are affected by hemolysis.[3] While blood sample hemolysis affects test results by causing a false decrease in albumin, alkaline phosphatase, and sodium, it also falsely increases alanine aminotransferase, aspartate aminotransferase, lactate dehydrogenase, creatine kinase, and, especially, potassium levels.[2,4] In addition, blood

FIGURE
Luer-Lock access device.

sample hemolysis causes positive interference in troponin I tests but false negative results for troponin T.[2] Therefore, many laboratories reject the hemolyzed blood sample and require repeat samples for the affected test. This situation prolongs the results of laboratory tests, causing delays in diagnosis, hospitalization, discharge, and treatment of patients and increasing the length of their stay in the emergency department.[5] In addition, blood sample hemolysis may lead to patient and nurse dissatisfaction.[6,7]

The high rates of blood sample hemolysis in the emergency department have been attributed to the frequent use of intravenous (IV) catheters.[8] However, in order to save time and provide comfort to the patient (by avoiding a second vascular access), in ED practice in our country, when both an IV infusion is to be placed and a blood sample is to be drawn, the blood samples are usually drawn with a syringe from the IV catheter after the vascular access has been placed. This poses risks such as needlestick injuries and blood contamination and increased hemolysis during the transfer of blood from the syringe to the blood tubes.[9] In recent years, blood drawing devices such as S-Monovette tubing (Sarstedt, Nümbrecht, Germany) and Luer-Lock access device (Becton Dickinson, NJ) (Figure) have been used to reduce blood sample hemolysis during phlebotomy from IV catheters.[9,10]

The aim of this study is to determine the rates of hemolysis in phlebotomy methods used in the emergency department and to determine the most appropriate phlebotomy method and device to reduce hemolysis of blood samples in the emergency department.

Methods

This study is a prospective, comparative descriptive study conducted in the Emergency Medicine Clinic of Kırşehir Training and Research Hospital between April 1, 2021, and May 31, 2021. The research involving human subjects was conducted in accordance with all relevant national regulations and institutional policies and was consistent with the principles of Declaration of Helsinki. It was approved by the Ethics Committee of the Faculty of Medicine of Ahi Evran University under number 2021-06/60. Patients were informed verbally about the study, and verbal informed consent was obtained.

SETTING AND SAMPLE

Our hospital is the only hospital in the city center and serves as a tertiary emergency service. The emergency department is visited by an average of 360,000 patients per year, and we have 36 nurses and 30 physicians working in our department. Regardless of their demographic characteristics and comorbidities, patients who presented to the emergency department with any complaint and required blood sampling for testing (biochemistry test) were included in the study. Patients younger than 18 years and patients who had an IV catheter placed by emergency medical services before admission to emergency department were excluded.

GPower 3.1.9.7 (Heinrich-Heine-Universität, Düsseldorf, Germany) program was used to calculate the sample size of the study. The Cohen's effect size (d = 0.17) was calculated using data from a similar study in the literature, and the total study group was calculated as a minimum of 573 with a margin of error of 5% and power of 95%.[11]

PROCEDURE

In the study, blood samples were collected from the vein with a steel straight needle or via an IV catheter. Syringes and blood transfer devices (Vacutainer and Luer-Lock access device) were used as phlebotomy devices. The syringe was used for phlebotomy with a steel straight needle as well as for blood drawing from the IV catheter hub. The Vacutainer (Becton Dickinson, NJ) was used for steel straight needle phlebotomy, and the Luer-Lock access device was used for blood drawing from the IV catheter hub. IV catheters with 2 different gauges, 22 G (blue) and 20 G (pink), were used for vascular access. The steel straight needle of syringe and the Vacutainer were 21 G. Accordingly, the patients who participated in the study were divided into 6 groups.

Group 1

Patients whose blood was drawn via steel straight needle using a syringe without establishing vascular access.

Group 2

Patients whose blood was drawn via steel straight needle using a Vacutainer (Holder) without establishing vascular access.

Group 3

Patients whose vascular access was established with a 22 G IV catheter and whose blood was drawn with a syringe.

Group 4

Patients whose vascular access was established with a 22 G IV catheter and whose blood was drawn with the Luer-Lock access device.

Group 5

Patients whose vascular access was established with a 20 G IV catheter and whose blood was drawn with a syringe.

Group 6

Patients whose vascular access was established with a 20 G IV catheter and whose blood was drawn with the Luer-Lock access device.

The study groups were studied sequentially. When one group was completed, the next group took its turn. Patients without exclusion criteria were assigned to the study group of the day by the nurse. Venous blood was collected from all patients who participated in the study. Blood was collected from the antecubital region by 6 nurses with at least 2 years of experience in emergency services. The nurses collecting the blood were previously trained about the study. Data were entered into the study form by the nurses who drew the blood. The study form included information on age, sex, whether vascular access was established, phlebotomy device used, IV gauge, and difficulty level of phlebotomy (easy, medium, difficult). Blood was collected in 5 mL gel serum tubes (BD Vacutainer SST II tube, Becton Dickinson, NJ), which had to be filled completely. Blood collected with the syringe was transferred to the tube by opening the cap. The tubes were sent to the biochemistry laboratory of the hospital by pneumatic system without waiting. The blood, which was allowed to clot in the laboratory for 30 minutes, was centrifuged at 2000 g for 10 minutes, and the serum was separated. The presence of hemolysis in the serum was detected using an autoanalyzer (AU 680; Beckman Coulter Inc, Brea, CA). Laboratory personnel were blinded to the study.

STATISTICAL ANALYSIS

Normality of the data was determined using the Kolmogorov-Smirnov test. Because age, which is a continuous parameter, was not normally distributed, the Kruskal-Wallis test was performed to compare the groups. Then, Dunn's nonparametric comparison was used for post hoc analysis. Chi-square test was used to compare categorical data. Significance was adjusted according to the post hoc Bonferroni method (adjust). Independent predictors of hemolysis were determined using logistic regression analysis. Hosmer-Lemeshow goodness-of-fit statistics were used to assess model fit. Statistical analyses were performed with SPSS for Windows version 21.0 software package (IBM Corp, Armonk, NY). P values of $< .05$ were considered statistically significant.

Results

A total of 715 patients participated in the study. The blood sample hemolysis rate of all samples sent to the laboratory from the emergency department was 25.7%. The median, minimum, and maximum ages of the participants were 49, 18, and 94 years, respectively. The number of male participants in the study was 298 (41.7%). Demographic characteristics and hemolysis rates of blood samples from the groups are summarized in Table 1.

Blood sample hemolysis was more frequent in men than in women (33.6% and 20.1%, respectively, $P < .001$) (Table 1). The lowest blood sample hemolysis rate was found in group 2 and the highest in group 3 (11.2% and 41.8%, respectively) (Table 1). Although hemolysis rates increased with increasing phlebotomy difficulty, there was no statistically significant difference (24.1%, 29.3%, and 36%, respectively).

The hemolysis rate in patients whose blood was drawn with the IV catheter (groups 3, 4, 5, and 6) was statistically significantly higher than in patients whose blood was drawn with a steel straight needle (groups 1 and 2) (32.1% and 17.4%, respectively).

There was no statistically significant difference in the hemolysis rates of patients (between groups 1 and 2) whose blood was drawn with a syringe and a Vacutainer without IV access (23.4% and 11.2%, respectively) (Table 1).

There was no statistically significant difference between the rate of blood sample hemolysis in patients whose blood

TABLE 1
Demographic characteristics and blood sample hemolysis rates of all groups

Variable	Group 1 (n = 158) (straight needl e-syringe)	Group 2 (n = 152) (straight needle-Vacutainer)	Group 3 (n = 98) (22 G IV catheter with syringe)	Group 4 (n = 87) (22 G IV catheter with Luer-Lock)	Group 5 (n = 112) (20 G IV catheter with syringe)	Group 6 (n = 108) (20 G IV catheter with Luer-Lock)	*P* value
Male, n (%)	75 (47.5)*	39 (25.7)*	36 (36.7)*	40 (46)*	60 (53.6)*	48 (44.4)*	< .001
Age, y	42 (31-57)	43 (29-59)	53 (30-71)	50 (33-62)	53 (39-70)	57 (41-71)	< .001
Hemolysis, n (%)	37 (23.4)*	17 (11.2)*	41 (41.8)*	28 (32.2)*	44 (39.3)*	17 (15.7)*	< .001

Age values are presented as median (25th and 75th percentiles).
The different symbols in the Table denote groups that do not differ post hoc in each column.
IV, intravenous; G, gauge.
* Indicates no statistically significant difference between the values in the groups of the same lines.

was drawn through a 22 G catheter with a syringe and with a Luer-Lock access device (41.8% and 32.2%, respectively). The rate of blood sample hemolysis in patients whose blood was drawn through a 20 G catheter with a Luer-Lock access device was statistically significantly lower than in patients whose blood was drawn with a syringe (15.7% and 39.3%, respectively) (Table 1).

The logistic regression analysis performed to determine the risk factors affecting blood sample hemolysis rates is summarized in Table 2. The result of the logistic regression analysis was that phlebotomy with Vacutainer without vascular access reduces the risk of hemolysis by approximately half compared with syringe (odds ratio [OR] = 0.47, P = .02). Phlebotomy through a 22 G catheter with a syringe statistically significantly increased the risk of hemolysis (OR = 2.64). Although phlebotomy with a Luer-Lock access device increased the risk of hemolysis (OR = 1.72), it was not statistically significant. Although phlebotomy via a 20 G catheter with Luer-Lock access decreased the risk of hemolysis, it was not statistically significant. Phlebotomy with a syringe statistically significantly increased the risk of hemolysis (OR = 2.20). According to logistic regression analysis, male sex statistically significantly increased the risk of hemolysis (OR = 1.92). According to the difficulty level of phlebotomy, difficult phlebotomy statistically significantly increases the risk of hemolysis (OR = 2.53).

Discussion

The literature reports a particularly high incidence of hemolysis (6%-30%) in ED blood samples.[8,12,13] In our study, the rate of hemolysis in ED blood samples was 25.7%, which is consistent with the literature. In our study, male sex and difficult phlebotomy were found to significantly increase the risk of blood sample hemolysis. Nevertheless, there is a contradiction in the literature between studies investigating the association between age, phlebotomy difficulty, and hemolysis.[8,14-16]

TABLE 2
Logistic regression analysis to estimate the probability of blood sample hemolysis

Risk factor	OR (95% CI)	*P* value
Syringe		< .001
Vacutainer (holder)	0.47 (0.25-0.88)	.02
Syringe with 22 G catheter	2.64 (1.50-4.63)	.01
Luer-Lock with 22 G catheter	1.72 (0.94-3.12)	.08
Syringe with 20 G catheter	2.20 (1.28-3.80)	.01
Luer-Lock with 20 G catheter	0.68 (0.35-1.31)	.25
Age	1.00 (0.99-1.01)	.93
Sex (male)	1.92 (1.34-2.76)	< .001
Degree of difficulty (easy)		.06
Degree of difficulty (medium)	1.39 (0.91-2.12)	.12
Degree of difficulty (difficult)	2.53 (1.02-6.26)	.05

R^2 = 0.09 (Cox and Snell), 0.13 (Nagelkerke).
Model χ^2 = 67.665 (df = 7), P < .001.
CI, confidence interval; OR, odds ratio; G, gauge.

Similar to previous research studies, we found that blood sample hemolysis rates were significantly higher in blood samples collected with an IV catheter than with a steel straight needle.[8,17,18] Some studies have found that the use of evacuated tube systems compared with a syringe is associated with higher blood sample hemolysis rates when blood is drawn with a straight needle as the method of phlebotomy.[16,19] However, in another study, it was found that the use of a syringe was found to cause a higher rate of blood sample hemolysis compared with evacuated tube systems.[20] In our study, we found that phlebotomy with the Vacutainer without IV access reduced the risk of hemolysis by about half compared with the syringe.

Researchers found that phlebotomy with the vacuum system, especially from IV catheters, increases hemolysis compared with manual aspiration.[9,13,21] It was found that blood sample hemolysis rates were higher when blood was collected from the IV catheter in the emergency department using the Luer-Lock access device compared with aspiration using the S-Monovette tube but lower than routine (aspiration using the syringe).[10] In addition to studies reporting that a decrease in catheter diameter results in a significant increase in hemolysis rates in blood samples, there are also studies reporting that there is no significant relationship between catheter diameter and blood sample hemolysis.[4,11,19,22] In our study, phlebotomy with a syringe was found to increase the risk of hemolysis in both 20 G and 22 G IV catheters. Phlebotomy via a 22 G IV catheter with Luer-Lock access device increased the risk of hemolysis, whereas phlebotomy via a 20 G IV catheter decreased the risk of hemolysis.

Limitations

The main limitation of our study is that it is a single-center study. The other limitation is the use of only 22 G and 20 G IV catheters in patients with IV access. In addition, the different age and sex distribution between the study groups could be considered a limitation of the study. Further studies are needed to investigate the effects of different catheter diameters on blood sample hemolysis outcomes.

Implications for Emergency Nurses

Blood sample hemolysis is a prevalent condition in emergency departments. Hemolysis leads to false results, repetitive blood draws, delays in diagnosis, and patients' prolonged stay in the emergency department, and this extra time causes patient and nurse dissatisfaction. Drawing blood through intravenous catheters in the emergency department increases the rate of hemolysis. In this large-sample study, the effects of different blood drawing methods and devices on blood sample hemolysis were compared. Blood drawing through a steel straight needle is the best method to reduce blood sample hemolysis. In cases in which drawing blood through the intravenous catheter is required, the utilization of a 20 G catheter and a Luer-Lock access device together reduces the rates of hemolysis and thus prevents its undesirable consequences.

Conclusion

According to the results of our study, phlebotomy with steel straight needles (especially the use of a holder) reduces blood sample hemolysis in the emergency department. Therefore, it is recommended that nurses consider obtaining blood samples with steel straight needles separately from the placement of the IV catheter. However, when that is not possible, we recommend phlebotomy from a 20 G IV catheter with a Luer-Lock access device in cases where phlebotomy via vascular access is required in the emergency department. We think that the result of this study may be important in terms of suggesting an alternative technique to reduce the hemolysis that occurs when blood is drawn from the IV catheter, which is an important problem in emergency services. In this regard, there is a need for studies with different catheter diameters and phlebotomy devices.

Data, Code, and Research Materials Availability

An ethics approval was obtained for this study from the ethics committee of Ahi Evran University Faculty of Medicine (Approval numbered 2021-06/60 and approval date 23.03.2021).

Author Disclosures

Conflicts of interest: none to report.

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Leadership Practices as Perceived by Emergency Nurses During the COVID-19 Pandemic: The Role of Structural and Psychological Empowerment

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Contribution to Emergency Nursing Practice

- During the -COVID-19 pandemic, nurses had moderate levels of clinical leadership practices, structural empowerment, and a high moderate level of psychological empowerment.
- Clinical leadership practices have been significantly correlated and predicted by structural and psychological empowerment.
- Number of patients with COVID-19, bed capacity, and patient-to-nurse ratio have predicted nurses' leadership practices.

Abstract

Introduction: To our knowledge, no studies have explored leadership practices in relation to structural and psychological empowerment among nurses during COVID-19. Therefore, the purpose of this study was to examine those relationships in Jordanian nurses working in emergency departments during the COVID-19 pandemic.

Methods: A descriptive, correlational cross-sectional design was used in this study. The participants were emergency nurses working at 3 large hospitals in Jordan. The participants were surveyed via an online questionnaire between September 2021 and January 2022. A total of 3 valid scales were included in the questionnaire to assess the nurses' clinical leadership practices in relation to perceived structural and psychological empowerment.

Results: A total of 193 emergency nurses were surveyed, of which 116 participants (60.1%) were male, and their average age was 29.64 (SD 4.74) years. Nurses had a moderate level of clinical leadership practices 12.50 (SD 1.65), moderate level of perceived structural empowerment 3.67 (SD 0.44), and a high-moderate level of perceived psychological empowerment 5.96 (SD 0.65). Clinical leadership practices were shown to have a significant positive relationship with structural ($r = 0.65$; $P < .01$) and psychological ($r = 0.74$; $P < .01$) empowerment. Predictors of clinical leadership practices of the Jordanian emergency nurses during COVID-19 were ranked in order of significance; structural and psychological empowerments were the highest significant predictors. However, patient to nurse ratio (>6 patients/nurse) was the lowest significant predictor.

Discussion: Although structural and psychological empowerments play a pivotal role in predicting the leadership practices of the emergency nurses in Jordan, the nurses should enhance their leadership style for better management and effective communication during critical situations such as pandemics.

Key Words: COVID-19; Structural empowerment; Psychological empowerment; Leadership practices; Nursing leadership; Nursing

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Introduction

Since the outbreak of the COVID-19 virus in December 2019 and its declaration as a global pandemic by the World Health Organization in March 2020, health care systems

have witnessed many significant clinical and social changes. The rapid spread of the virus, increased number of critical cases, and the continuous shortage of nursing staff have imposed an unprecedented demand on health care providers, necessitating urgent expansion of hospital capacities and staffing in many countries.[1]

It has been reported that nurses' clinical leadership practices are vital to creating safe health care environments.[2] Cook has defined clinical leadership as "a nurse directly involved in providing clinical care that continuously improves care through influencing others."[3] Further, it had been defined as "staff nurse behaviors that provide direction and support to patients and the health care team in the delivery of patient care."[4] These definitions highlight the capacity of nurses to lead and affect patient care by using specific leadership skills.

A significant body of research indicates that clinical leadership practices are linked to nurses' perceptions of a particular work environment. Nurses who perceive that they are working in a place with structural and/or psychological empowerment may experience better outcomes, including less job stress, more job satisfaction, and better organizational commitment.[5] Structural empowerment is defined as an organization's ability to provide employees access to 6 vital organizational structures, including information, resources, support, development opportunities, and formal and informal power.[6] However, psychological empowerment refers to nurses' abilities to engage and feel congruence between their personal values and those of the organization.[7] In addition, when nurses perceive that their work environment provides them with opportunities to advance their career, they feel structurally and psychologically empowered.[8]

CLINICAL LEADERSHIP PRACTICES

Due to the enormous complexity of today's health care organizations, the roles of clinical nurses have been expanded to lead in all aspects of patient care. Leadership is known as the process of influencing others to achieve specific goals.[9] Leadership is often conceptualized as a top-down phenomenon. Many health care organizations empower front-line nurses to make clinical decisions, coordinate workflow, and maintain group processes at the point-of-care. Accordingly, studies have shown that most health organizations have leaders from all units and at different organizational levels, and their actions have helped achieve quality and safe health care outcomes.[10,11]

Clinical leadership roles may vary; they are a combination of nursing roles and general leadership skills. This study conceptualized the clinical leadership constructs based on the Kouzes and Posner[12] leadership model. The authors suggest that leadership is not a rank or position; rather, it is a collection of the individual's practices that guide leaders to accomplish their goals. These approaches include questioning the process, inspiring a shared vision, empowering people to act, leading by example, and encouraging the heart (Kouzes and Posner[12]). According to this viewpoint, nurse managers' employment of the 5 leadership practices, as well as the amount of structural and psychological empowerment in their work settings, would have an impact on nurses' clinical leadership practices.[13]

STRUCTURAL EMPOWERMENT

Empowerment is defined as the process of identifying disempowering factors, removing them, and improving individual self-efficacy. Structural empowerment indicates that changes in the organization structure can affect nurses' behaviors and decisions. Kanter supposed that there were 2 sources of power in organizations: "formal power" and "informal power."[14] Kanter asserted that both powers must be used to provide employees with access to organizational structures that empower them. These empowering structures include: "support" (feedback from peers and managers), "information" (data required to work efficiently), "resources" (money, time, materials needed to accomplish tasks), and "opportunity" (chance to grow and develop). Research reveals that these components of structural empowerment are important to decrease nurses' burnout, maintain a culture of trust, and improve patient outcomes.[15]

PSYCHOLOGICAL EMPOWERMENT

Psychological empowerment is referred to as an individuals' attitude to gain control at the workplace; it is a sense of empowerment that occurs due to cognitive processes within the individual. There are 2 dimensions of psychological empowerment: (1) "meaning," which reflects the perception of being valued and feeling freedom at the workplace; (2) "impact," which is the perception of being able to affect the work process. Research recognizes that psychological empowerment may contribute positively to organizational and individual outcomes.[16]

STUDY SIGNIFICANCE

Few studies have investigated leadership practices in relation to structural and psychological empowerment. Therefore, the purpose of this study was to look at those links among

Jordanian nurses working in emergency departments during the COVID-19 epidemic. In this study, the following particular objectives were investigated:

1. Examine the levels of perceived clinical leadership practices and structural and psychological empowerment of emergency nurses in Jordan.
2. Test the relationship between clinical leadership practices and structural and psychological empowerment of emergency nurses in Jordan.
3. Identify the factors predicting clinical leadership practices of emergency nurses in Jordan.

Methods

The care of patients with COVID-19, especially in the emergency department, requires a high integration of clinical and leadership skills to support patients and families. In Jordan, registered nurses undertake the majority of health care activities in the emergency department. Although there are no specialized certificates required for emergency nurses, Jordanian nurses are well qualified to work in the emergency department due to the continuous training courses provided by their hospitals. Overall, registered nurses handle the majority of health care tasks in Jordan's emergency rooms; however, basic nursing activities such as monitoring vital signs could be performed by the practical nurses.[17] In Jordan, emergency nurses work about 48 hours per week in rotating shift schedules of either 8 or 12 hours. In most cases, emergency nurses provide care for 1 patient at a time; however, due to heavy workload and staff shortage, nurses may service more patients than expected. Nurses deal with cases with different acuity levels, and all necessary resources (especially medications) are always available in most emergency departments. However, there is a lack of updated guidelines of emergency treatments and management.[18-20]

SAMPLE AND DESIGN

A descriptive, correlational, cross-sectional design was used in this study. The participants were emergency nurses working at 3 large hospitals in Amman, Jordan. The 3 hospitals are educational and serve as training centers for many nursing and medical students. In addition, because they contain most of the surgical and medical specialties, the hospitals are transformative and receive Jordanian and non-Jordanian patients. The participants were surveyed via an online questionnaire. A total of 3 valid scales were included in the questionnaire to assess the nurses' clinical leadership practices and perceived structural and psychological empowerment.

The study was reviewed and approved by the Institutional Review Board at Zarqa University and the 3 main hospitals. Data were collected between September 2021 and January 2022. A Google Form (Google) was created, and the link to the form was shared with nurse managers in each hospital who then forwarded it to the nurses. All the nurses employed in the emergency department in the 3 hospitals were invited to participate in the study. Nurses provided their consent by agreeing to complete the questionnaire. Participants were anonymized, and all collected data were stored, electronically transcribed and kept secure using password-protected files in a Windows (Microsoft) computer to assure confidentiality. Only the researcher had access to raw data.

A total of 350 questionnaires were distributed, and 193 nurses (55%) completed the questionnaires accurately and returned them. The minimum required sample size was calculated using the power analysis procedure described by Cohen.[21] Considering a 5% margin of error, 90% confidence level, medium effect-size, and multiple regression analysis as the highest needed statistical procedure, the minimum required sample size was 165 nurses.

INSTRUMENTS

Clinical Leadership Inventory

The clinical leadership inventory questionnaire was used to measure the clinical leadership practices of the nurses working in the emergency department.[4] This tool was developed by Patrick et al[4] based on the Kouzes and Posner model[22] and consists of 15 items on a 5-point Likert scale. The items are distributed into 5 subscales with a potential range of total scores ranging from 5 to 15 for each subscale; higher scores indicate better perceptions of clinical leadership practices. The Cronbach alpha for this instrument was 0.86 in the original study[4] and 0.89 in this study.

Conditions for the Work Effectiveness Questionnaire-II

The conditions for work effectiveness questionnaire-II was developed to measure the 4 structural empowerment dimensions based on the Kanter theory of structural empowerment.[7] The scale consists of 4 subscales, which include access to information, support, resources, and opportunity. Each item was measured on a 5-point Likert scale, and the total score was calculated by summing the subscale means. The total score range is between 1 and 5. Higher scores represent stronger perceptions of structural empowerment.

Many studies have validated the scale, with the Cronbach alpha ranging from 0.78 to 0.93[23]; Cronbach alpha was 0.87 in this study.

Psychological Empowerment Scale

The scale was developed by Spreitzer[24] and comprises 4 subscales: meaning, competence, self-determination, and impact. The scale consists of 12 items, with 3 questions for each subscale. Participant responses are ranged on a 7-point Likert scale valued numerically from 1-7 points wherein: "Very Strongly Disagree = 1," "Strongly Disagree = 2," "Disagree = 3," "Neutral = 4," "Agree = 5," "Strongly Agree = 6," "Very Strongly Agree = 7." The total psychological empowerment score is calculated by taking the means of the 4 subscale means. The range of possible total score is between 1 and 7. Higher scores represent better perceived psychological empowerment. The psychological empowerment scale has been validated in over 50 different studies. Lyu et al[25] obtained a Cronbach alpha of 0.85-0.88 when using this questionnaire in their study.The Cronbach alphas of the subscales in this study ranged from 0.86 to 0.90.

STATISTICAL ANALYSIS

IBM SPSS Statistics 23.0 was used to analyze the data. The leadership practices, structural empowerment, and physiological empowerment levels of emergency nurses were analyzed using different descriptive statistics. The Shapiro-Wilk test was used to check the normality of the study variables. Also, the relationship among leadership practices, structural empowerment, and physiological empowerment were analyzed using Pearson r correlations.

Multiple leaner regressions were used to analyze factors predicting leadership practices of the emergency nurses. Before running the analysis, the variance inflation factor was used to test for the absence of multicollinearities. Also, the assumptions of linearity, normality, and homoscedasticity were assessed for any potential violations.

Results

The final sample consisted of 193 emergency nurses; 116 participants were male (60.1%), and their average age was 29.64 (SD 4.74) years. More than half of the participants were married 103 (53.3%) and had a bachelor's degrees in nursing 113 (58.5%). The average experience was 8.79 (SD 2.24) years. The average number of patients with COVID-19 in the emergency departments was 11.16 (SD, 4.61). Regarding bed capacity in the emergency departments, 66.8% of nurses worked in units with more than 20 beds, and 71.6% worked with a nurse/patient ratio of >6 because of the COVID-19 pandemic.

TABLE 1
Mean and SD of the study variables (n = 193)

Surveys	Mean (SD)
Clinical leadership inventory	
Challenging	12.55 (1.54)
Enabling	12.62 (2.34)
Inspiring	12.31 (2.32)
Modeling	12.54 (1.61)
Encouraging	12.48 (1.78)
Total	62.50 (8.29)
Total mean	12.50 (1.65)
Conditions for work effectiveness questionnaire-II	
Opportunity	3.22 (0.54)
Information	3.62 (0.71)
Support	3.89 (0.47)
Resources	3.74 (0.62)
Formal power	3.68 (0.37)
Informal power	3.88 (0.77)
Total	22.03 (2.64)
Total mean	3.67 (0.44)
Psychological empowerment scale	
Meaning	6.41 (0.52)
Competence	5.26 (0.24)
Self-determination	6.42 (0.26)
Impact	5.78 (0.56)
Total	23.87 (2.62)
Total mean	5.96 (0.65)

Means and standard deviations were used to analyze the 3 surveys (Table 1). Nurses had a moderate level of clinical leadership practices 12.50 (SD 1.65), moderate level of perceived structural empowerment 3.67 (SD 0.44), and a high-moderate level of perceived psychological empowerment 5.96 (SD 0.65).

Table 2 presents bivariate analyses using the Pearson r correlation to examine the relationships between clinical leadership practices, structural empowerment, and psychological empowerment. Clinical leadership practices were shown to have a significant positive relationship with structural empowerment ($r = 0.658$; $P < .01$) and psychological empowerment ($r = 0.745$; $P < .01$).

TABLE 2
Correlations coefficients between CLI, CWEQ, and PES (n = 193)

Variables	CLI total	CWEQ total	PES total
CLI total	1		
CWEQ total	0.658*	1	
PES total	0.745*	0.261	1

CLI, Clinical leadership inventory; CWEQ, conditions for work effectiveness questionnaire; PES, psychological empowerment scale.
* $P < .01$.

Multiple regression analyses were performed to determine the predictive ability of the total structural empowerment score, total psychological empowerment score, and staff characteristics variables ($P < .05$) on the dependent variable, clinical leadership practices.

After performing the preliminary bivariate analyses, age ($F = 1.21$, $P = .03$), gender ($F = 0.74$, $P = .04$), marital status ($F = 0.83$, $P = .07$), and educational level ($F = 1.36$, $P = .14$) were excluded from further analyses, because clinical leadership practices were not significantly associated with these variables. However, total structural empowerment score, total psychological empowerment score, total years of experience, number of patients with COVID-19, bed capacity (>20 bed), and patient to nurse ratio (>6 patients/nurse) were included in multivariate analyses. The subscales of structural empowerment and psychological empowerment were dropped from the model because their overall scores and the subscales were highly correlated. As presented in Table 3, the results showed that 1 or more predictors had a significant association with clinical leadership practices $F_{(5, 187)} = 12.34$, $P < .001$. Predictors of clinical leadership practices of Jordanian emergency nurses during COVID-19 were ranked in order of significance; structural empowerment and psychological empowerment were the highest significant predictors. However, patient to nurse ratio (>6 patients/nurse) was the lowest significant predictor. Together, these variables accounted for 37.4% of the variance in clinical leadership practices.

Discussion

This study was mainly focused on examining the levels of perceived clinical leadership practices and the structural and psychological empowerment of emergency nurses in Jordan. The research also examined the relationship among the 3 variables and predicted the clinical leadership practices of emergency nurses. The results showed that the nurses felt that they performed clinical leadership practices. In addition, emergency nurses perceived that they were structurally and psychologically empowered; the results are in line with those of previous studies.[26-28] During the COVID-19 pandemic in Jordan, emergency nurses were challenged to develop new practices autonomously and support patient care. That is, nurses were allowed to innovate and contribute greatly to the care of patients with COVID-19. They used this opportunity to practice their leadership skills and to make an impact on patient care. Also, Jordanian nurses received supportive resources, which made them feel valued with the desire to contribute more.

The findings of this study validate and support those of previous studies in the matter of clinical leadership practices having a positive and significant relationship with structural and psychological empowerment.[5,13] However, this finding contradicts that of a previous study conducted in New

TABLE 3
Predictors of clinical leadership practices (n = 193)

Predictor	B	$_{SE}$ of B	Beta	T
CWEQ	0.023	0.021	0.115	4.325*
PES	0.054	0.004	0.135	4.274*
Total years of experience	0.024	0.009	0.241	3.215*
Number of COVID-19 patients in the unit	0.054	0.010	0.151	2.756†
Bed capacity (>20 bed)	0.026	0.008	0.134	2.614‡
Patient to nurse ratio (>6 patients/nurse)	0.148	0.032	0.261	3.031‡
Model summary: $R = 0.567$, $R^2 = 0.374$, $_{Adj}R^2 = 0.317$, $F = 12.345$*				

CWEQ, conditions for work effectiveness questionnaire-II; PES, psychological empowerment scale; SE, standard error.
* P < .001.
† $P < .01$.
‡ $P < .05$.

Zealand,[15] where nurses' leadership behavior levels were low and did not significantly correlate with their perceived structural and psychological empowerment. Empowered nurses exhibit leadership behavior that promotes and supports patient care and brings forth desired vibrancy in their settings. Being structurally and psychologically empowered in the workplace implies that the workplace offers nurses not only hard work but also the opportunity to learn new clinical and management abilities. However, structural and psychological empowerment levels vary across organizations due to many factors, including organizational structure and culture, organizational policies and procedures, and leadership styles.

In predictors of clinical leadership practices, structural and psychological empowerment showed the greatest contribution. Also, this study suggests that some personal factors and characteristics of the work environment, such as nurses' years of experience, number of patients with COVID-19, bed capacity, and patient-to-nurse ratio, may affect nurses' leadership practices. The result supported the proposition of the Kouzes and Posner leadership model,[12] and also was similar to those of studies that revealed that nurses who perceive a strong structural and psychological empowerment felt more independent and motivated in their work[29] and demonstrated leadership behaviors.[30,31] These findings indicated that structuralpsychological empowerment is key for nurses to develop and practice leadership activities. In addition, the results suggest that supporting the employee with opportunities, information, and resources is highly valued by nurses and fosters them to work better.

Furthermore, a Canadian study found a relationship between nurses' leadership practices and their years of experience.[32] Novice nurses focus on challenges in their new jobs; they want to be directed, motivated, and coached continuously with constructive feedback. Over time, they become more self-oriented, lead others, and practice independently.[33]

Limitations

There are some limitations to be considered in this study. First, the sampling method was convenient. Second, only emergency nurses were recruited to participate in the study; therefore, the results cannot be generalized to other nurses. Third, data were collected online, which decreased the control on the data collection procedure. Fourth, it is always difficult to draw a causal inference from cross-sectional studies.

Implications for Emergency Nurses

This study suggested that the number of patients with COVID-19, bed capacity, and patient-to-nurse ratio might predict nurses' leadership practices. The result is consistent with those other studies[34-36] that confirmed that nurses had learned how to make quick decisions in uncertain situations. Early in the COVID-19 pandemic, little was known about the disease. The crisis brought many challenges for health care managers, including a high volume of patients with COVID-19 and a continuous need for additional beds and supplies. This critical situation, especially in the emergency department, developed significant concerns and challenges for the nursing staff. However, nurses found innovative strategies to lead and practice independently to enhance the patients' quality of care over time. A study conducted in Turkey found that the clinical leadership skills of nurses were higher than normal during the COVID-19 pandemic. The crisis helped nurses to be more autonomous and investigate new options under difficult situations.[36,37]

Conclusion

This study was intended to examine the levels of perceived clinical leadership practices and explore the relationships between clinical leadership practices and structural and psychological empowerment in Jordanian nurses working in emergency departments during the COVID-19 pandemic. Overall, the findings revealed that Jordanian emergency nurses believed they performed clinical leadership practices and were structurally and psychologically empowered during the COVID-19 epidemic. However, organizational levels of structural and psychological empowerment differ due to various factors such as organizational structure and culture, policies and procedures, and leadership styles. Building on this knowledge, nursing leaders should continue to focus on the elements necessary to empower clinical nurses, including with better communication and management skills, during critical situations such as pandemics.

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Author Disclosures

Conflicts of interest: none to report.

The study was granted ethical approval by the Institutional Review Board at the faculty of nursing at Zarqa University under approval number ZU-7/2021.

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Erratum to Emergency Nurse Consensus on Most Effective and Accessible Support Strategies During COVID-19: A Delphi Study [*Journal of Emergency Nursing*, Volume 48, Issue 5, September 2022, Pages 538-546]

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We regret that Table 2 was not displayed correctly in the above article. The corrected Table 2 is shown below. We would like to apologize for any inconvenience caused.

TABLE 2
Initial survey responses indicating top-rated strategies

Topic	Employee-led strategy	Employer-led strategy
Perceived effectiveness	Self-care activities that enhance social well-being, such as establishing new and enhancing existing relationships with peers, friends, and family	None
Perceived accessibility	None	None
Likelihood of participation	Self-care activities that enhance your social well-being, such as establishing new and enhancing existing relationships with peers, friends, and family Self-care activities that enhance your emotional well-being, such as practicing stress management, relaxation, mindfulness, reflective writing/journaling	None

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Erratum to The Effects of Motivational Messages Sent to Emergency Nurses During the COVID-19 Pandemic on Job Satisfaction, Compassion Fatigue, and Communication Skills: A Randomized Controlled Trial [*Journal of Emergency Nursing*, Volume 48, Issue 5, September 2022, Pages 547-558]

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We regret that the first author's name was written incorrectly as Sonya Goktas, and instead should have been written as Sonay Goktas.

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